TUCK INSIDE? LEARN NEW SKILLS WE SHOW YOU HOW

apc

MAY 2020 #480

YOUR EXPERT GUIDE TO TODAY'S TECH

AUSTRALIAN PC AWARDS

THE BEST OF THE BEST

INSIDE: ALL THE WINNERS!

HOW TO MAKE

WORKING FROM HOME

WORK FOR YOU

WFH FTW!

Tips & tools to stay productive

+ save your job, health and sanity

PCs JOIN THE FIGHT AGAINST COVID-19

CAN COMPUTERS SOLVE THIS?

YOU CAN HELP TOO!

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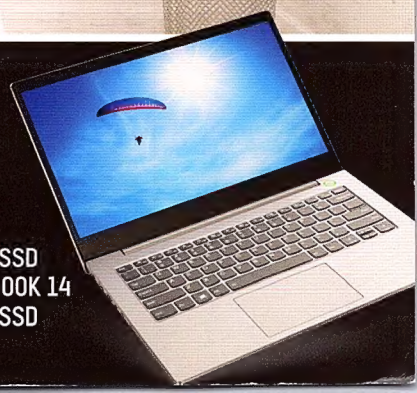
STEP-BY-STEP GUIDES

- PC: GET ORGANISED IN PHOTO STUDIO
- MAC/iOS: CONTROL MUSIC AND TV APPS
- LINUX: THE SMARTER WAY TO DELETE FILES

RED HOT REVIEWS

- DELL XPS 13
- SAMSUNG T7 TOUCH SSD
- SEAGATE GEN4 SSD
- LENOVO THINKBOOK 14
- SEAGATE GEN4 SSD



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- One USB port for 3G/4G LTE mobile broadband access, USB printer, storage and thermometer
- 3 x Gigabit LAN ports with 30,000 NAT sessions
- IPv6 & IPv4
- Object-based SPI Firewall, Content Security Management (CSM) and QoS
- 16 x VPN tunnels including 8 x SSL-VPN tunnels
- 802.11ac (AC1200) Wi-Fi, up to 300 + 867Mbps speed (ac model)
- Support VigorACS 2 Central Management System for remote network management
- 2 years back to base warranty

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- 2 x USB ports for 3G/4G access, FTP server and Network printers
- Load Balance and Failover functions for WAN and USB 3G/4G WAN
- 4 x Gigabit Ethernet LAN ports with 30,000 NAT sessions
- IPv6 & IPv4
- NAT throughput over 450Mbps
- Object-based SPI Firewall, Content Security Management (CSM) and QoS
- 2 x VPN tunnels including 2 x SSL-VPN
- 802.11ac (AC1200) Wi-Fi, up to 300 + 867Mbps speed
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- Support VigorACS 2 Central Management System for remote network management
- 2 years back to base warranty

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Be brave, new world

We will adapt and survive.

First things absolutely first – the *APC* team and I send our hopes that you are faring as well as can be in this unbelievable, surreal, barely comprehensible crisis. The national statistics would unfortunately indicate that many of you reading this will have lost your jobs, or seen your income drop. Maybe by a whole lot. The unremitting numbers also mean that there may well be readers holding this issue that have been infected, and are feeling pretty awful right now. If that's you, we all sincerely wish you a safe and speedy recovery.

We all need to support our friends, family and the community, and we are indeed all doing just that. If anything good has come from this it's the genuine care we see every day. I've experienced it many times recently. As well as the bad. But this situation seems to be a great leveller, and apart from the occasional toilet paper idiot, everyone is being awesome to each other.

The world has changed, and will stay changed in some key ways. In terms of how we go about our daily activities working from home is a huge one. IT departments across the globe have been scrambling to set staff up with the gear, software and support they need to get the job done. We know many of *APC*s readers are IT professionals, and we're all proud of your undoubtedly intense and stressful work.

From sheer necessity companies have been forced to rapidly adapt, and move to operations with remote workers. Besides the massive logistical challenges, there's the big old issue of trust. A lot of managers at all levels have trouble believing their workers are working unless they can see them at their desks for eight hours a day. It's an old-school carry-over that is vanishing rapidly before our eyes. Workers now placed at home are not about to bludge off and put their livelihood at risk. We're all living in fear of the companies that employ us collapsing, or being forced into painful layoffs. We all need to row the damn boat to survive.

The trust issue is being blown away as we speak. When things get better I have no doubt that many companies will embrace remote working as the new way forward. The infrastructure cost savings are potentially immense for companies. The productivity gains for home workers equally huge. We have the IT infrastructure coming together rapidly, and by the time this is over it will be finely honed and ready for the long term.

Phew. What a time. A hell of a lot of it completely sucks, but there's a silver lining waiting for us. I hope. Take care all.

BEN MANSILL
EDITOR
ben.mansill@futurenet.com

ps. On a brighter topic, next issue will be APC's 40th birthday! Issue one went onsale way back in May 1980. Another time, another world! We'll see you next month for a bit of a well earned celebration in these pages.

"We all need to support our friends, family and community, and we are indeed all doing just that. If anything good has come from this it's the genuine care we see every day."

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ISSUE 480, MAY 2020

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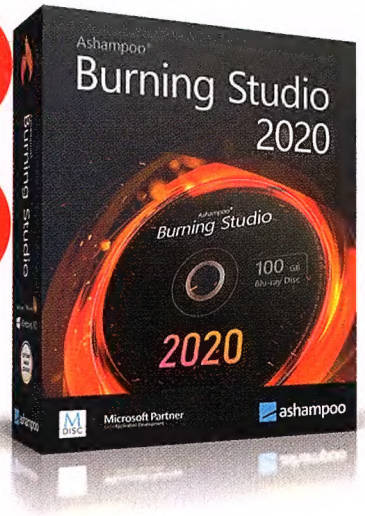

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Ashampoo Burning Studio 2020 is a powerful disc burning software for CD, DVD and Blu-ray discs. The software quickly burns files, audio and video to all recordable disc types but also specialised media such as BDXL or M-Disc. The built-in disc ripping auto-detects track names and easily turns audio files into custom audio discs complete with individually designed covers and inlays. Playlists can be auto-generated during ripping for easy playback in the desired song order. The program can also finalise discs to make them playable on older retail players or car radios.

DOWNLOAD LINK: **www.ashampoo.com/lpa/apcmagazine**

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FEND OFF ONLINE THIEVES

NEUTRALISE SPYWARE WITH ABELSSOFT ANTILOGGER.

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"Loggers" are a variety of spyware that secretly install onto a PC and intercepts all keystrokes or taps on the user's screen. With AntiLogger, Abelssoft introduces a security program that can unmask and disable loggers before they obtain sensitive user data. Online crime is booming. And the favored tools of cyber-criminals are perfectly effective enough to provide them with plenty of valuable user data. Suspicious processes can easily be stopped with Abelssoft Antilogger, while benign processes falsely identified as malicious loggers will be placed on a "non-malicious software" list to prevent any further false alarms.

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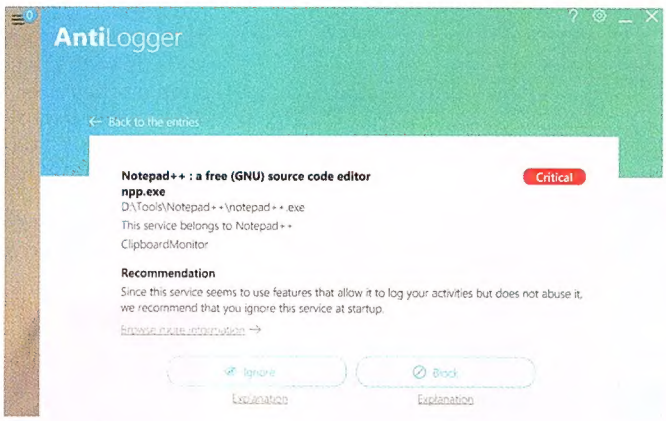

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"While we all wait for a vaccine, you can help contribute to the scientific fight. The Folding@Home project has added COVID-19 as a project you can donate spare compute time towards, to help scientists understand the virus better." *page 72*

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Asus ZenWiFi
Simple setup, decent features and superb performance make this good-looking system very attractive.
Last year, we drooled over Asus' RT-AX92U Wi-Fi 6-based mesh, which resembled two small routers, connected over a 5GHz backhaul connection, that could provide a single, Ethernet-like internet connection all over the house. We loved the bombproof reliability and speed it offered to everything that connected to it. Now here's a cheaper AC version which is more consumer-friendly in terms of looks, price and setup. How does it fare?
We think this might be the simplest device setup we've ever experienced (which is saying something with Wi-Fi). After downloading the partner app, the phone found the router and connected to it without us doing anything. It asked for Wi-Fi network names and whether we wanted two separate 2.4GHz and 5GHz bands or use one, combined network and then it just worked. To join the second node, we had to power it on within three metres of the first device, click "Search" and everything synchronised. We then moved it two floors up to our gaming-room-cum-office and connected it to the PC which is normally connected to the primary router via a powerline adapter that achieves 90Mb/s performance. With the AX-based predecessor, the 4,804Mbps-rated backhaul connection saw this rise to a solid 386Mb/s performance that prompted us to subsequently update our entire testing methodology.
The theoretical top speed is 3,000Mb/s spread across a 2.4GHz and two 5.4GHz 802.11AC bands. We used our regular Wi-Fi test by downloading large video files from a Synology DS1019+ NAS to a Wi-Fi 6-equipped Dell XPS 15 OLED laptop in a three-storey Sydney town house. At close range it managed an excellent 303.2Mb/s. One floor up (between the nodes) scores fluctuated between 229.9Mb/s and 500Mb/s. On the top floor, near the second node, it fluctuated between 423Mb/s and 496Mb/s. Despite the occasional wobble with the top speeds, the connection itself never faltered and it was never slow. To double-check its reliability we also played a great deal of Call of Duty and found that ping and playability was consistent with wired performance.
Asus' phone app is simple to use and offers a great many monitoring and management options alongside the usual Wi-Fi offerings. You can quickly see what's accessing your network, block that access, or limit it. You can also group devices into easy-to-manage parental control groups. An 'Insight' tab offers tips regarding security and updates while Settings displays the usual Wi-Fi options including multi-faceted QoS and Port Forwarding. Asus' AiCloud takes care of content on USB-connected storage devices while AiProtection monitors network security and updates. Advanced features, similar to the RT-AX3000 (opposite page) are available via the web interface. Our only gripe is having a stingy three Ethernet ports on each node.
At $549 it's significantly cheaper than its older, big brother was at launch but that has now dropped in price to be only $50 dearer. However, while the Wi-Fi 6 variant is slightly more stable, few domestic users will need the extra speed, and the better looks and ease of management of the ZenWiFi will appeal to many.
Nick Ross
Verdict
Almost achieves perfection for demanding home users.
www.apcmag.com 33

Inside APC

Find out all about *APC*'s editorial policies, test practices, how to read the benchmark results, and more.

APC is Australia's oldest consumer technology magazine – having been consistently in print for forty years, since our first issue way back in May 1980 – and we take that heritage and responsibility very seriously. While our focus is obviously on the personal computer – it's in our name, after all – the very definition of the PC has changed and shifted markedly since the early 1980s. As such, we touch on many other areas of tech, too, from smartphones and apps to peripherals, accessories, online services and beyond. We have two main goals: to track down the best of modern tech and also to help our readers make the most of it.

We're also an open church in terms of platforms. We know most people aren't wed to a single brand's products and use a variety of devices. And, like you, *APC*'s journalists want to know what's good in tech – no matter what platform it resides on.

INDEPENDENT REVIEWS

Championing technology doesn't mean we're unrelenting yes-men and -women, however, and *APC* aims to be as objective as possible in all our coverage. That means identifying the best products from multiple perspectives – the best performance, best value and best features and, ideally, the products that offer the best mix of these three.

As a matter of policy, reviews published in *APC* are not shared with product-makers prior to print. We will contact vendors under certain conditions; for example, if we have a problem testing a product that seems to indicate it may be faulty, or to invite a vendor to clarify how a particular feature works. If an *APC* reviewer has any potential conflicts of interest involving a brand, the review will always be assigned to another writer.

LABS TESTING

Despite being a small magazine with limited resources, *APC* still strives to conduct the most rigorous, objective scientific tests and benchmarks we can so as to make our reviews as unbiased as possible. We use a variety of tools and programs for this, including many freely available benchmark suites for assessing media encoding, general system performance, gaming and battery life.

In most cases, for the benchmark results published in *APC*, you can assume that higher is better. There are certain tests that deviate from this rule where the opposite is true; in those cases, we've flagged the results with a note explaining as such.

We use both tables and graphs for displaying results; the latter are our preference due to their ease-of-readability, but tables are more compact, so we use these in cases where thoroughness is preferred.

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Wi-Fi 6

Work From Home In Any Room

Next Generation Whole Home Mesh Wi-Fi System

WORKS WITH amazon alexa

Deco X60/X20

Wi-Fi Dead-Zone Killer

Seamless Roaming

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technotes

» ALL THE NEED-TO-KNOW TECH NEWS

Amazon Prime next-day delivery withdrawn for some non-essential products

EXPECT TO WAIT LONGER EVEN IF YOU'RE A PRIME MEMBER.

Managing demand during the ongoing coronavirus outbreak seems to have already begun to prove difficult for Amazon after shoppers reported delays when trying to purchase non-essential items from the ecommerce giant. The company announced that it would begin prioritising the most in-demand essential items from its warehouses in late March. However, this shift has made it increasingly difficult for consumers to order non-essential items from Amazon.

Computex show postponed until September

WORLD'S BIGGEST PC SHOW BOWS TO NECESSITY.

As trade shows and events all fell one-by-one to the coronavirus effect, Computex organisers held on as long as they could, but now the show – which was scheduled for the first week in June – has now been put off until September 28-30. The show also normally runs for six days. Taiwan, where Computex is based, has been one of the world's most successful countries in combatting the pandemic.

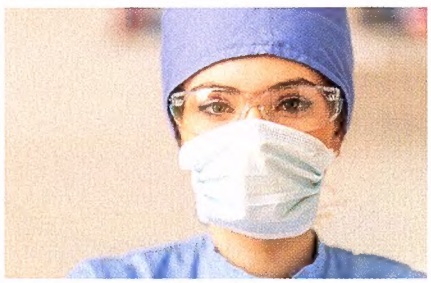

image: istock

Razer converts factories to make surgical masks

WILL DONATE ONE MILLION UNITS.

Razer CEO, Min-Liang Tan, tweeted that Razer is converting its factories to make surgical masks. This comes in amidst the coronavirus pandemic, to which the company wishes to contribute some of its resources. The gaming peripheral maker intends to manufacture at least one million surgical masks, which it will donate to frontline healthcare staff around the world.

Intel launch high performance 10th-gen mobile CPUs

TARGETING GAMING LAPTOPS.

Six new Comet Lake H 10th-gen mobile CPUs have been announced by Intel, and are expected to start appearing in partner laptops soon. These new CPUs compliment Intel's lower power and lower performance Ice Lake 10th-gen CPUs, with Intel hoping these CPUs find their way mainly into gaming laptops. According to Intel "we're focussed on frequency", and the highest clocked CPU in the family – the i9-10980HK – peaks at an impressive 5.3GHz Turbo. All run at 45W at stock frequencies, but will run higher in Turbo mode, although Intel declined to reveal what that higher power consumption levels would be.

We very much look forward to testing laptops equipped with these, and stacking them up against AMD's 4000-series products. During the announcement Intel compared the CPUs with three-year-old products, claiming a 30-40% improvement. When asked how they compared to Intel 9th-gen CPUs Intel told us that no comparative testing had yet been done with the previous generation, which was somewhat remarkable to hear.

INTEL 10TH-GEN COMET LAKE

	CORES/THREADS	BASE FREQ	TURBO	INTEL SMART CACHE	TDP
I9-10980HK	8/16	2.4 GHZ	5.3 GHZ	16 MB	45 W
I7-10875H	8/16	2.3 GHZ	5.1 GHZ	16 MB	45 W
I7-10850H	6/12	2.7 GHZ	5.1 GHZ	12 MB	45 W
I7-10750H	6/12	2.6 GHZ	5.0 GHZ	12 MB	45 W
I5-10400H	4/8	2.6 GHZ	4.6 GHZ	8 MB	45 W
I5-10300H	4/8	2.5 GHZ	4.6 GHZ	8 MB	45 W

Ryzen Mobile 4000-series

CAN AMD TAKE A BIGGER SLICE OF MOBILE?

The notebook market has not been kind to AMD over the last decade – for a long time the company was only ever seen as the discount option for those on a strict budget. Fast forward to 2020, and notebook users are eagerly awaiting the arrival of products based on AMD's latest Ryzen Mobile 4000 series processors, which combine up to eight Zen 2 cores and upgraded Vega graphics into a small CPU for the notebook market.

These parts are designed for ultraportable notebooks, and AMD has a number of design wins lined up to show just how good an AMD system can be. The same silicon will also go into 45W-class notebooks, with a higher base frequency. These parts are geared more towards discrete graphics options, for gaming notebooks or more powerful business designs. The gaming market (at 45W), the commercial market (15W to 45W) and the ultraportable market (15W) are where AMD is hoping to strike hardest with the new hardware.

AMD 4000-SERIES

	CORES/ THREADS	BASE FREQ	TURBO FREQ.	L2	L3	GPU CUS / GPU FREQ.	TDP
RYZEN 9 4900H	8/16	3.3 GHZ	4.4 GHZ	4 MB	8 MB	8/1750 MHZ	45 W
RYZEN 9 4900HS	8/16	3.0 GHZ	4.3 GHZ	4 MB	8 MB	8/1750 MHZ	35 W
RYZEN 7 4800H	8/16	2.9 GHZ	4.2 GHZ	4 MB	8 MB	7/1600 MHZ	45 W
RYZEN 7 4800HS	8/16	2.9 GHZ	4.2 GHZ	4 MB	8 MB	7/1600 MHZ	35 W
RYZEN 5 4600H	6/12	3.0 GHZ	4.0 GHZ	3 MB	8 MB	6/1500 MHZ	45 W
RYZEN 5 4600HS	6/12	3.0 GHZ	4.0 GHZ	3 MB	8 MB	6/1500 MHZ	35 W
RYZEN 7 4800U	8/16	1.8 GHZ	4.2 GHZ	4 MB	8 MB	8/1750 MHZ	15 W
RYZEN 7 4700U	8/8	2.0 GHZ	4.1 GHZ	4 MB	8 MB	7/1600 MHZ	15 W
RYZEN 5 4600U	6/12	2.1 GHZ	4.0 GHZ	3 MB	8 MB	6/1500 MHZ	15 W
RYZEN 5 4500U	6/6	2.3 GHZ	4.0 GHZ	3 MB	8 MB	6/1500 MHZ	15 W
RYZEN 3 4300U	4/4	2.7 GHZ	3.7 GHZ	2 MB	4 MB	5/1400 MHZ	15 W

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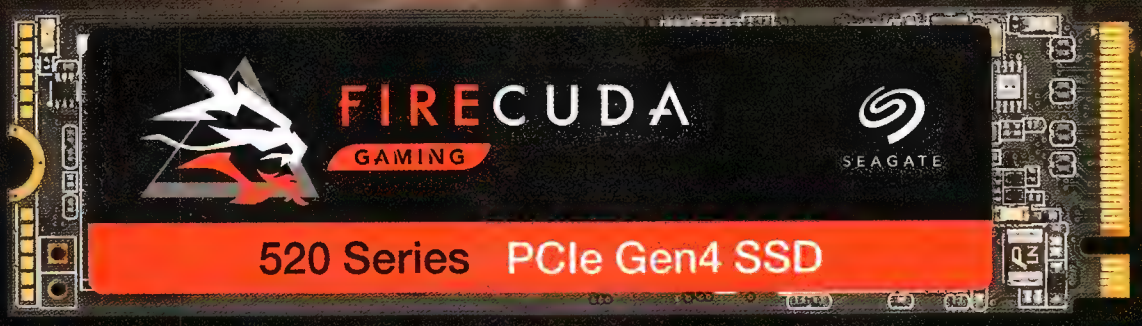

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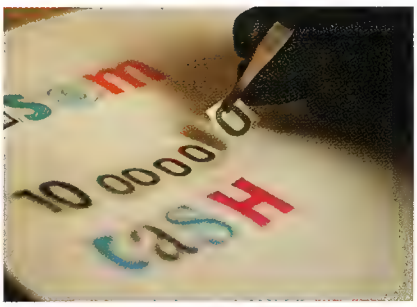
PCIe GEN4 x4, NVMe 1.3	UP TO 5,000/4,400 MB/S SEQ. READ/WRITES	UP TO 3,600 TB TBW
M.2 2280 DOUBLE-SIDED	UP TO 2 TB	5 YEAR LIMITED WARRANTY

Best-Fit Applications

- Performance gaming PC
- Creative professional systems
- High-performance PCs and workstations

SEAGATE

image: shutter stock



AMD's Big Navi and Xbox Series X GPU 'Arden' source code stolen and leaked

OFFERED FOR SALE FOR $100 MILLION.

AMD has announced that it had found stolen graphics IP posted online, followed quickly by news from *Torrentfreak* that the information pertains to source code for Big Navi and Arden GPUs. *Torrentfreak* claims to have contacted the hacker responsible, who in turn claims the information is worth US$100 million and is seeking bidders. AMD says that while the information hasn't been posted yet, the leaked information is not core to its competitiveness and the company is taking legal actions to remedy the situation.

Newer MacBook Air models suffer from Retina display issues

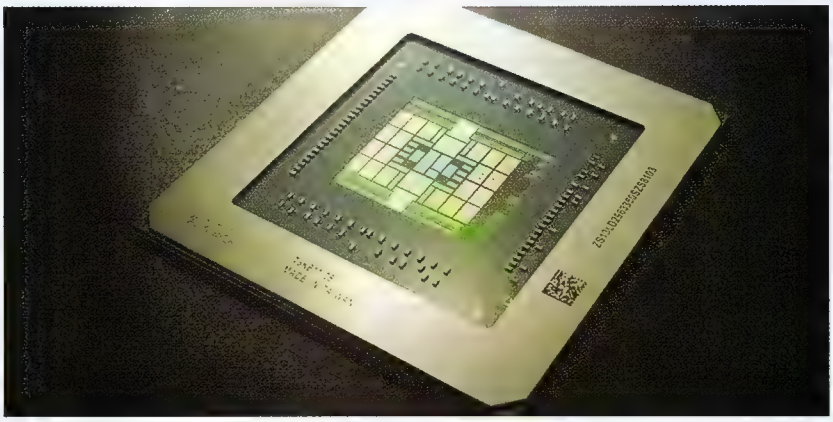
APPLE ADMITS TO THE FAULT.

MacBook Air (2018 and newer) owners should take a careful look at their laptop screens because some units are suffering from the same anti-reflective coating issues seen on the MacBook Pro and the now-discontinued MacBook. The issue causes the anti-reflective coating on the displays to delaminate and wear away. Apple acknowledged the problem exists on the newer MacBook Air with Retina display models.

Correction

AORUS 17 XA GPU.

In the last (479) issue of *APC*, our review of the Aorus 17 XA stated in one section that the laptop was powered by a GTX 2080 GPU. This was an error, the laptop comes equipped with a GTX 2070 GPU. We apologise for the error.



AMD's RDNA 2 gaming architecture will fully support DirectX 12 Ultimate

SUPPORTING MODERN FEATURES LIKE DIRECTX RAYTRACING AND VARIABLE RATE SHADING IS INCREASINGLY IMPORTANT.

AMD has announced that its upcoming RDNA 2 gaming architecture will fully support DirectX 12 Ultimate. AMD RDNA 2 will power the next generation of AMD Radeon graphics cards and the Xbox Series X. The architecture has four key features, DirectX Raytracing (DXR), Variable Rate Shading (VRS), Mesh Shaders, and Sampler Feedback.

DXR makes games look more realistic. AMD and Microsoft worked together to design DXR 1.1, which is an update to the original DXR. The newer version features better performance and improved efficiency for many raytracing effects. AMD states that when devices such as PCs and consoles support DXR 1.1 and AMD RDNA 2 architecture that gamers will "experience stunning, next-level visuals in games that support DirectX 12 Ultimate."

One of the main benefits of companies like AMD and Microsoft working on a unified standard is that new features will be in more games. AMD states that "With this new common graphics standard for both PC and consoles, gamers can expect to see advanced effects like raytracing come to more games sooner." AMD adds that DirectX 12 Ultimate also makes things easier for developers.

Report: Apple unleashing Arm-based Macs in 2021

THE RUMOUR MILL KEEPS CHURNING.

In 2021, Apple is expected to start launching several Macs computers with Arm processors instead of x86 Intel CPUs, according to a report from *MacRumors*. The rumour comes from Apple analyst Ming-Chi Kuo, and it isn't the first time he has said this would be happening.

Kuo is adamant that switching over to Arm CPUs on a portion of Apple's lineup will help the company reduce its reliance on Intel and cut the company's CPU costs by anywhere from 40-60%, *MacRumors* reported. Given Intel's troubles getting to smaller fabrication nodes, it's plausible that Apple would be contemplating other CPU partners. The x86 architecture is also ageing, and Arm chips have the potential to run more efficiently.

A switch would require significant changes and additions to Mac OS and would also be a nightmare for program developers, who will have to port their programs over to the new architecture if they want to keep up. Thus, at least in the short run, any potential savings from switching to Arm would likely be overshadowed by development costs.

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www.asus.com/au/Mesh-WiFi-System/ZenWiFi-AX-XT8

*Actual data throughput and coverage will vary from network conditions and environmental factors.

The fight against coronavirus goes nuclear

Folding@Home now more powerful than world's top 7 supercomputers, combined. You can help, too.

Propelled by average enthusiasts in their shared quest to defeat COVID-19, the Folding@Home network is now pushing out 470 PetaFLOPS of raw compute power. To put that in perspective, that's twice as fast as Summit, the world's fastest supercomputer, making the network faster than any known supercomputer.

It's impressive that the Folding@Home network is now more than twice as powerful as Summit's 149 PetaFLOPS of sustained output: ORNL announced two weeks ago that Summit had also joined the coronavirus fight and has already found 77 different small-molecule drug compounds that might be useful to fight the virus. Summit employs 220,800 CPU cores, 188,416,000 CUDA cores, 9.2PB of memory, and 250PB of mixed NVRAM/storage for the task.

But Summit is far faster than the other supercomputers further down the Top500 list. That means the Folding@Home network is also now faster than the world's top seven supercomputers, combined. That's equivalent to the horsepower of 27,433,824 CPU/GPU cores that are being used in the most powerful systems in the world. These leading supercomputers are typically only used by nation-states for decidedly more nefarious purposes, such as nuclear research, so seeing this type of compute power unleashed for the common goal of defeating the coronavirus is certainly encouraging.

Here is a view of the enemy, stunning in its complexity, and deadly in its intentions. This virus may be sweeping the globe, pushing large portions of the world into isolation at both the national and personal level, but the global community is coming together through the Folding@Home network to fight back by furthering research into possible cures or vaccines. This consists of using your computer to complete small chunks of much larger problems, thus giving researchers access to an unprecedented amount of compute horsepower.

Distributed computing has always been a great hobby because of the detailed stats compilation and the dizzying number of teams involved, but Folding@Home's addition of coronavirus research to its normal pursuits, like cancer, Alzheimer's, and Parkinson's research, has led to an overwhelming amount of new users. Folding@Home reports that it has seen a 1,200% increase in contributors, with Bitcoin miners also joining the fight, and over 400,000 new volunteers have joined over the last two weeks.

Unfortunately, that surge in demand has led to a shortage of work units (the small chunks of larger workloads sent to each user), but Folding@Home has expanded its capacity to serve units to speed production. Work units are still being issued and many more are in the pipeline.

You can help, too, by simply installing the Folding@Home application (**https://foldingathome.org/**) and turning over some of your spare CPU or GPU horsepower to help defeat the virus. It only takes a few minutes to set up the program, and then it's effortless as the program runs in the background. You don't need serious PC horsepower to make a meaningful contribution – every single bit helps. It's entirely possible that some old-school Pentium somewhere will calculate the bits that serve as the final piece to solving this deadly puzzle. ■ **Paul Alcorn**

Greg Bowman
@drGregBowman
As promised, here is our first glimpse of the #COVID19 spike protein (aka the demogorgon) in action, courtesy of @foldingathome . More to come!

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gadgets

» GIZMOS AND GOODIES.

FREEBOARD 5-X

Turn any road into your very own snow field.

US$325 | IGG.ME/AT/FREEBORD/X#/

While there's no electronics in the Freeboard 5-X, there's supposedly 23-years-worth of technology behind its creation. A worthy cause for a longboard that allows you to carve the concrete in a way that mimics snowboarding. The new movement is created by independent spring loaded trucks with hanger arms for each wheel and additional rotating seesaw wheels that allow you to roll from edge to edge as if you are riding a flat bottom board. The deck of the board also includes bindings that hold it to your feet so you can lean into turns even better and feel more confident in the air.

SIGNIFY PHILIPS HUE OUTDOOR RANGE

Low voltage, high impact smart LED lighting for your garden.

FROM $129 | WWW2.MEETHUE.COM

Signify already had a few outdoor lights to choose from, but in March the company announced a new range to bolster its outdoor smart lighting system. The new smart garden lighting array includes two new sets of stylised wall and pedestal outdoor lights, a new set of post path lighting, a Discover Outdoor Floodlight with sensor and a set of spotlights to light up every area of your garden in whatever colour you want. All lights include the ZigBee daisy chain network features to make connectivity easier and the new lights offer all the advanced smart functionality of the existing Hue range.

ATREUS KEYBOARDIO

A mechanical to-go.

US$99 | KCK.ST/3B0PESA

While there's a lot of decent laptop keyboards out there today, anyone who does a lot of work on the go will know that it is so much nicer to use a premium standalone keyboard to do the bulk of your work. The new Atreus keyboard from Keyboardio is a compact, ergonomic mechanical keyboard that is small enough for you to take on your travels so you don't have to sacrifice on keyboard quality on the go. With just 44 keys and dramatically repositioned backspace and spacebar keys, the Atreus will take a little getting used to, but if you can rewire your brain a little, you'll gain access to this fully mechanical, 25cm keyboard.

EYERIDE HUD

A sony OLED display and wireless speaker for your bike helmet.

€259 | KCK.ST/38LFZQV

This EyeRide HUD package consists of a Bluetooth helmet headphone and a compact heads up display built by Sony that can be installed in a wide array of existing motorbike helmets to display your smartphone screen in your helmet visor. The display works with touch controls on the speaker to allow you to interact with your device while minimising distractions. This interface makes it significantly easier to see critical information like street directions without having to take your eyes off the road, and it also makes screening phone calls and listening to music much easier.

AR WARRIORS: GAME CONTROLLER FOR MULTIPLAYER SHOOTERS

Use your smartphone to play AR airsoft.

US$60 | KCK.ST/33E6SQI

The AR Warriors: Game Controller for multiplayer AR is a rifle-shaped controller with a mount for your phone that allows you to play real world multiplayer skirmishes using your smartphone. The trigger and sidearm buttons control what happens on screen and the game uses GPS to arrange weapon upgrades and resource drops. The game uses a system of t-shirts and headbands with identifying barcodes in order to recognise targets and while it works with a wide range of existing Android and iOS devices, you can buy modifications like lens scopes to improve the overall range.

SUUNTO 7

Another ray of Suunto-shine in the fitness smartwatch market.

$800 | SUUNTO.COM

Suunto's new flagship GPS sports watch is powered by Qualcomm's Snapdragon Wear 3100 chip and offers a 12 hour battery life in GPS mode or 48 hours under more moderate usage conditions. The sports focus is again, of course the focus here offering over 70 specific activity tracking modes, but the full Wear OS integration means it also works exceptionally well as a smartwatch. The Suunto 7 may look stylish enough to fit in at office meetings, but it's got 5ATM water resistance, a Gorilla Glass display and a barometer/ altimeter to make it rugged enough to be a handy companion in the wild.

A PC gamer's look at the Xbox Series X and PlayStation 5

New console tech is great for us PC users too.

We're getting closer to the release of the next generation of gaming consoles, the Xbox Series X and the PlayStation 5. Both take a big step forward over their predecessors. With developers having better baseline hardware and technologies to develop for, PC gamers will benefit too. Both consoles are due for release later in 2020, though with the ongoing pandemic dominating the global narrative, there's the possibility we may see one or both fall back to 2021.

Let's have a look at the hardware. Both consoles will run AMD 8-core Zen 2 processors. While it's likely there will be some system specific instructions, they can be considered largely similar to their desktop counterparts. The Xbox Series X CPU will run up to 3.8GHz, while the PS5 one will run up to 3.5GHz. Both consoles will run 16GB of GDDR6 memory. This means both take a big step up in bandwidth.

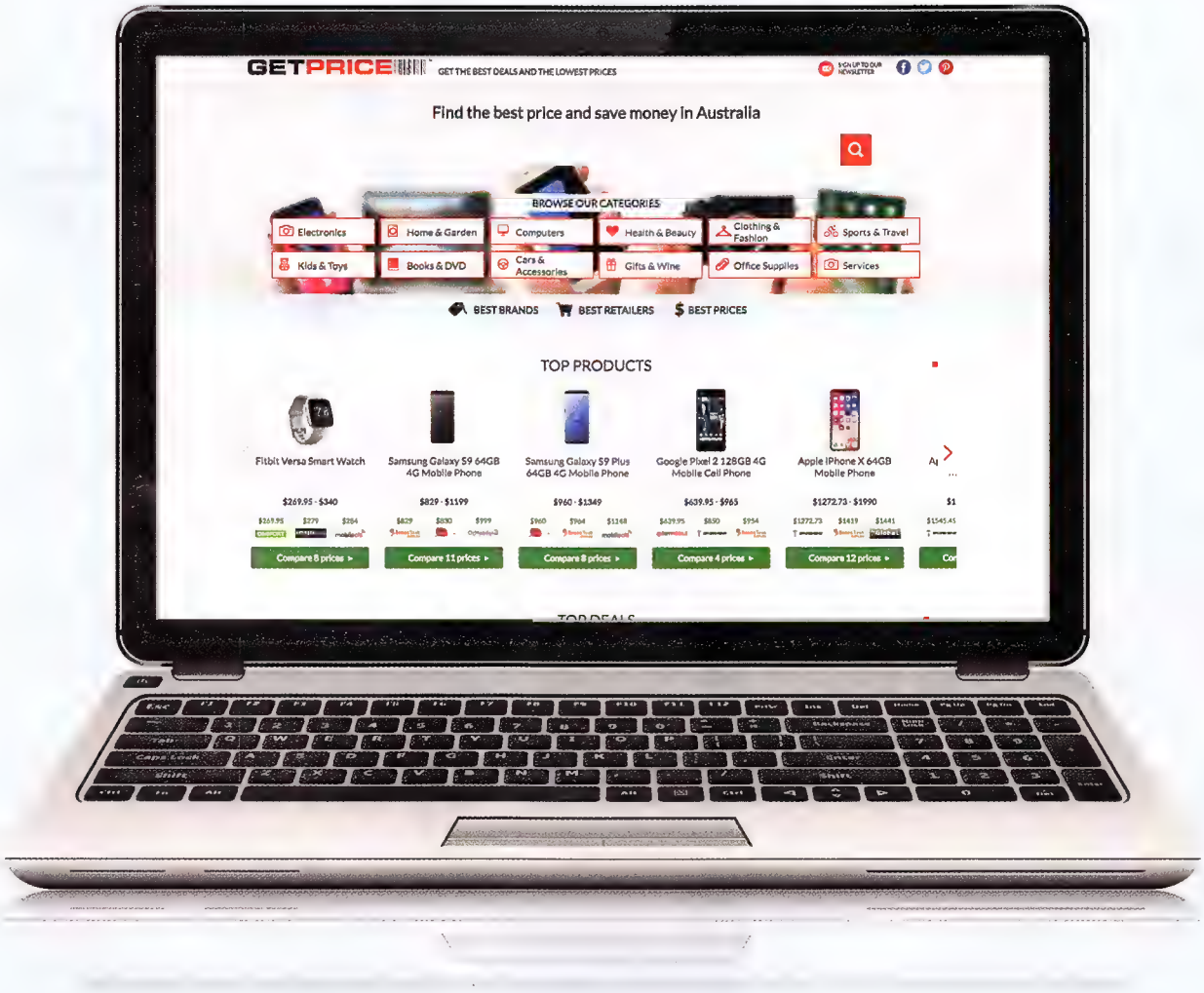
Then there are the GPUs. Both consoles will run customised AMD RDNA2 graphics. RDNA2 is the successor to the current RDNA 'Navi' architecture as found in the likes of the RX 5700 series. On paper, both consoles' GPUs will be faster than a 5700XT. Both consoles add ray tracing support, previously only available with Nvidia's RTX series. If a couple of hundred million gamers own ray tracing hardware, look for it to move beyond a niche. If we assume AMD and Nvidia's next generation desktop GPUs will feature top-to-bottom ray tracing support, then expect developers to allocate a lot more resources into it.

The PS5 will feature a 36 Compute Unit GPU clocked at 2230MHz. The Xbox X ups the CU count to 52, albeit with a lower 1825MHz clock. This gives the Xbox a sizeable lead in FLOPs, with 12,155 compared to 10,280 of the PS5. It remains to be seen which path is the optimal one, though on paper, both consoles should be able to run 4K at 60Hz with the right optimising. This will be important as 4K TVs are increasingly prevalent. If a console can run at 4K/60Hz with high graphical fidelity, then PC gamers will benefit too. Things like resolution scaling and variable frame rate support should lead to easier porting of games.

Arguably the biggest changes come from the move from positively sluggish HDDs to SSDs. Loading times and level transitions are a real pain in the derriere, so to essentially eliminate loading times is a big step forward. The Xbox X utilises what appears to fairly standard performing NVMe SSD, while the PS5 makes use of a PCIe 4.0 drive. The latter has a massive 5.5GB/s transfer rate, which is a match for the fastest PC drives.

So, the next generation consoles appear to be very powerful and with a couple of hundred million of them selling over the coming years, we're looking at a welcome leap forward in gaming technology. The features and performance that PC gamers have had access to for a while will become well and truly mainstream. Game developers now have no reason to treat PC gamers as afterthoughts, at least until PC technology inevitably marches ahead again. I for one hope we'll see *Grand Theft Auto 6* launch on PC alongside the Xbox X and PS5 launches.

PC Master Race! ■



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Pandemic may not be the 'new normal', but surveillance likely will be

Stopping coronavirus is a global priority, but it will have long term consequences, writes Shaun Prescott.

Efforts to stem the spread of coronavirus, which at the time of writing has infected over 775,000 people and killed over 37,000, will undoubtedly come to define how we remember 2020. Government responses have varied dramatically, and while the Australian government's response has been far from perfect, it has taken measures that demonstrate, at least, that it takes the matter very seriously indeed.

That the world will be indelibly changed by this pandemic almost goes without question: factors like the economy are, naturally, the biggest talking points. But the pandemic has also created a 'new normal' when it comes to surveillance technology. In China, for example, drones have been used to ensure infected or at risk citizens follow quarantine instructions, and the *Guardian* reports that "getting into one's apartment compound or workplace requires scanning a QR code, writing down one's name and ID number, temperature and recent travel history." Other measures include facial recognition technology which can detect fevers in public spaces.

Meanwhile in South Korea, smartphone GPS data, credit card purchases and public camera footage is used to trace the movements of coronavirus patients, according to the *New York Times*. Italy is also reportedly using mobile phone location data to ensure patients are keeping to quarantine measures.

Well, that's China, South Korea and Italy, some might deflect. But look at Australia: Western Australian police have already announced that drones will be used to issue "public service announcements" in public spaces, in order to police social distancing and mass gathering rules. Meanwhile, the University of South Australia has proudly announced it is working on a 'pandemic drone', which "will be fitted with a specialised sensor and computer vision system that can monitor temperature, heart and respiratory rates, as well as detect people sneezing and coughing in crowds, offices, airports, cruise ships, aged care homes and other places where groups of people may work or congregate."

It's reasonable enough to argue that some of these measures might actually be useful to fight the spread of the virus – when the world collectively faces a problem on this scale, things need to rapidly change to fight it.

But is there any guarantee that these new surveillance measures will ever go away? Edward Snowden, the former NSA contractor gone whistleblower, has already warned that the ramping up of digital surveillance could accelerate the erosion of American civil liberties. And history demonstrates that once governments seize new ways to control, they will not let go. The most obvious example is the US Patriot Act introduced in the wake of the 9/11 terrorist attacks, which bolstered the surveillance powers of the US government.

Yes, it seems inevitable that the coronavirus pandemic will change the world on a similar scale to 9/11, in both obvious and obtuse ways. Now, near the beginning of what seems likely to be a very long 2020, it's hard to imagine the consequences. But if you're shouted down by a temperature-taking drone in the Woolworths toilet paper aisle in 2022, leading to immediate social ostracisation, you'll look back on 2019 with starry-eyed nostalgia. ■

Share your stories!

If you have an interesting story about technology users, their experiences and the issues that affect us all (whether funny or serious), email us at **apcmag@futurenet.com**. All correspondence becomes the property of *APC* and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

random access

» JOEL BURGESS STEPS INTO THE FRAY.

Amazon asks for donations during booming sales to pay staff sick leave

World's richest man pleads for someone else to pay his workers.

I think it's safe to assume that no business in the world has been totally unaffected by the spread of the coronavirus, and there have been a myriad of responses ranging from inspiring to downright disgraceful. One decision that sits towards the latter end of that spectrum seems to have come from Amazon – one of the few online marketplaces that has seen a considerable uptick in sales following the outbreak of the COVID-19 pandemic and which in 2019 recorded US$11.9 billion in annual profit.

After announcing it would be hiring 100,000 workers to meet the new demand, Amazon explained that its army of contract workers would not receive paid sick leave, but were instead able to apply for a salary grant for any coronavirus related sick days through a newly established Amazon Relief Fund. The global online marketplace did contribute US$25 million dollars to form the basis of the fund, however the company is expecting someone else to foot the bill if it turns out to cost more. According to a *Popular Information* investigation, Amazon began appealing for public donations to bolster the COVID-19 kitty, including links distributed via text message to contribute via credit card, PayPal or through direct payroll deductions for current employees.

Amazon did announce that it'll provide up to two weeks of paid sick leave for any of its full time employees who contract the virus (which is not mandatory in many US states), but it doesn't change the sentiment that one of the world's most profitable companies is pleading for crowdsourcing dollars from people doing it tough to pay its contract employees sick leave.

Amazon is engaged with around 800 third party companies that make up a delivery driver workforce of around 75,000 and at least 150 delivery stations employing another 90,000 workers. While not all of these companies will be able to access the relief fund, Amazon has provided enough capital for somewhere between 5,000 and 62,500 of these employees to get compensation. While this might seem reasonable, it only provides the minimum US$400 payment for up to 38% of the contract workforce, a seemingly low proportion seeing as drivers are some of the only people required to move around and interact with others during the partial lockdown conditions.

Based on the minimum wage for delivery drivers, the fund could afford to pay the wages of up to 12.5% of minimum wage contract workers for two weeks sick leave, before it then runs out.

Amazon employees had tested positive for COVID-19 in at least 10 fulfilment or returns facilities at the time of writing and the US took the lead in coronavirus cases worldwide late in March, so there's every possibility that contract workers could drain the Amazon Relief Fund well before the demand runs out. ■

Joel Burgess

numbercrunch

» WE LOOK AT THE NUMBERS DRIVING THE BIG TECH NEWS.

2030

The year by which Microsoft expects to have become carbon negative – aiming to remove from the environment all the carbon it has emitted since 1975.

US$1 BILLION

The revenue earned by Twitter in Q4 2019, the first time it's hit that figure.

2039

The year by which Daimler, maker of Mercedes Benz cars and others, intends to make its entire passenger vehicle fleet carbon neutral.

22GWH

Is the amount of renewable energy A G Barr has sourced from wind generation to power its Irn Bru factories.

27,000

The number of folds it took to break the hinge in Motorola's new foldable Razr phone, in testing by CNET.

2020

Telstra plans to be carbon-neutral this year, according to CEO Andy Penn.

howit'sdone

The main folding mechanism is an impressive feat of engineering.

Prepare yourself for some sticky gunk when pulling apart the latest phone.

Motorola Razr

When almost everything is done right.

If you're still rocking that iconic Razr flip-phone from 2004, we have good news: those "podcast" things really took off, *The Incredibles* finally got a sequel, and there's a new Razr that'll blow your mind. Let's test its teardown-ability.

MAJOR TECH SPECS

- 6.2-inch 2142x876 foldable plastic OLED display (~373 ppi)
- 2.2GHz octa-core Qualcomm Snapdragon 710 processor
- 6GB of RAM, 128GB of storage, 2,510mAh of battery power
- 16MP f/1.7 main camera with dual-pixel autofocus and one 5MP f/2.0 selfie camera

KEY FINDINGS

- Back in our day, the Motorola Razr was the coolest thing around. We're happy to see that the new Razr keeps the sleek look. All the modern-day gear adds bulk, though. The new Razr is 35 percent wider and 118 percent heavier than our 2004 V3, so it's less pocketable than you'd think.
- Our first target is the lower rear cover. Behind the fancy folding façade, this is still a smartphone like any other, so we're guessing a hot iOpener is our ticket in. A little heat does the trick! Once all the glue is sliced, the cover can wiggle free. But the fingerprint sensor cable, next to the home button, is waiting to be torn by eager disassemblers.
- Battery ho! But no other fun goodies, so we opt to pop the Quick View display off the other side. Despite some nasty glue, it eventually comes free, and we catch our first glimpse of the second battery. The first battery's ready for removal in the bottom half of the phone, but the second is still hiding behind some cables in the top half. Above the batteries, the single 16MP main camera stares back at us.
- As we hone in on the flexible display, we hope we don't mess it up, but for now, we're breezily unscrewing Torx screws with our handy Mako kit. With a bit of alcoholic coercion, the first battery comes free. One brief pit stop on our race to mobo glory: In removing the vibration motor (a boring coin-style one), we spot some curious slime.
- Flipping this floppy foldable is a lot easier after a few more screws, and gives us access to the cameras and second battery. With the pOLED display removed, we're dismayed that the battery comes with it. Prying against this flexible sheet for a battery swap doesn't seem ideal, even if the battery is in a metal caddy. We finally have both batteries; the second packs more punch, at 1,265mAh and 4.8Wh, than the wafer-thin 4.7Wh cell we extracted earlier.
- Motorola's nostalgia-stoking Razr wins the award for most complicated phone-based contraption we've ever taken apart. We're impressed with the numerous feats of engineering that Moto pulled off to resurrect its iconic clamshell. It won't win any awards for serviceability, but just bringing this gizmo into existence was such a tall order that we're not surprised serviceability didn't make it into v1.0. It's fun to see how they made it happen.
- Repairability Score: 1 out of 10 (10 is easiest to repair). The only driver you need is a standard T3 Torx. The delicate primary display is replaceable, if you're determined. Every repair starts (and ends) with stubborn, glued-on outer covers. Replacing the batteries requires near-total disassembly. The charging port is soldered directly to the main board. Complex construction and multiple flex cable booby traps make for tricky repair work. ■

The 2020 Australian PC Awards

Celebrating the very best in PCs and PC gear.

In the fiercely competitive and innovative world of the PC, it's always an exciting thrill seeing products and technologies come along and shake things up and move the industry forward. We use and choose good gear because of the performance on offer, the nice design, the new things it lets us do. We buy something for these reasons, and are always mindful of the value when comparing options.

It is these tangibles that drive the Australian PC Awards each year. The Awards are a joint undertaking by several of Future Publishing's technology titles, being *APC*, *TechLife*, *PC PowerPlay*, *TechRadar* and *PC Gamer*. The teams behind these magazines and sites live, love and breath PC tech, and together we have distilled all of the most notable releases of 2019 across all of the important PC categories.

This year we have introduced a new and particularly exciting Award. Excellence is as broad as the world of technology itself, and is awarded to "the person, product or technology that advanced the PC more than any other in 2019." We had a lot of fascinating debate coming up with the shortlist for that award, but there was none when it came to choosing the irrefutably worthy winner.

We hope you agree with at least some of our choices. We know not everyone will, but we are quite certain that across all of these finalists and winners are some superb products and technologies that are being used and appreciated right at this moment by many of you.

We extend warm congratulations to the winners, and the people behind the products that work so hard to bring you the best.

VIDEO CARDS

BEST OEM BUDGET CARD – NVIDIA

FINALISTS: MSI GeForce GTX 1660 Super Gaming X 6GB, Gigabyte GeForce GTX 1660 Super Gaming OC, Asus GeForce GTX 1660 Super TUF Gaming X3 OC, Gigabyte GeForce GTX 1650 Super WindForce OC 4GB, MSI GeForce GTX 1650 Super Ventus XS OC 4GB

WINNER: **Gigabyte GeForce GTX 1660 Super Gaming OC**

This card is faster than a stock GTX 1660 Ti, it's cheaper plus Gigabyte gave it a solid OC that makes it faster than even more expensive models.

BEST OEM BUDGET CARD – AMD

FINALISTS: Gigabyte Radeon RX 5500 XT Gaming OC 4GB, Asus Radeon RX 5500 XT Dual EVO OC 8GB, MSI Radeon RX 5500 XT Mech OC 4GB, PowerColor Radeon RX 5500 XT Red Dragon 8GB

WINNER: **MSI Radeon RX 5500 XT Mech OC 4GB**

Superb build quality combined with cool and quiet running and competitive value make the MSI RX 5500 XT the pick of AMD's budget bunch.

BEST OEM PERFORMANCE CARD – NVIDIA

FINALISTS: Asus ROG-Strix-RTX2080TI-O11G-Gaming, EVGA GeForce RTX 2080 Super FTW 3 Ultra, Asus GeForce RTX 2080 Super ROG Strix OC, Gigabyte GeForce RTX 2080 Super Aorus Waterforce 8GB, Asus ROG Strix GeForce RTX 2070 Super 8GB, Aorus GeForce RTX 2070 Super 8G

WINNER: **MSI GeForce RTX 2080 Super Gaming X Trio**

Cheaper than many other variants this usually outpaces them, is quieter and has more overclocking headroom.

BEST OEM PERFORMANCE CARD – AMD

FINALISTS: Sapphire Radeon RX 5700 XT Nitro+, PowerColor Radeon RX 5700 XT Red Devil, Asus Radeon RX 5700 XT ROG Strix OC, Gigabyte Radeon RX 5700 XT Gaming OC 8GB, Asrock Taichi Radeon RX 5700 XT 8GB, MSI Radeon RX 5700 XT Gaming X 8GB

WINNER: **Asus Radeon RX 5700 XT ROG Strix OC**

Coming in $50 cheaper than more expensive models with better cooling solutions, the custom PCB design and VRM topology help this card beat the rest relying on reference designs.

ASUS

BEST MOTHERBOARD MAKER

FINALISTS: Asus, Asrock, Gigabyte/Aorus, MSI

WINNER: **Asus**

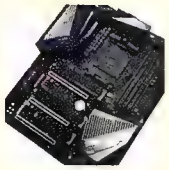
Asus motherboards repeatedly impress with their reliability, refinement and continual innovation.

BEST PREMIUM MOTHERBOARD – INTEL

FINALISTS: Gigabyte X299X Designare, Asus Prime X299 Edition 30, Asus Maximus XI Formula, Gigabyte Z390 Aorus Xtreme Waterforce

WINNER: **Asus Maximus XI Formula**

The Asus ROG Maximus XI Formula is perfectly suited to being the stunning centrepiece of an overclocked RGB watercooled build.

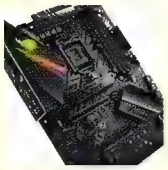


BEST PREMIUM MOTHERBOARD – AMD

FINALISTS: Gigabyte X570 Aorus Master, Gigabyte X570 Aorus Xtreme, MSI X570 Ace, Asus ROG Zenith II Extreme

WINNER: **Gigabyte X570 Aorus Master**

The Gigabyte X570 Aorus Master offers a very well balanced blend of features and design choices combined with a real feel of refinement.

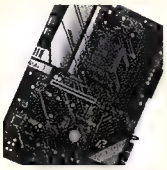


BEST BUDGET MOTHERBOARD – INTEL

FINALISTS: Gigabyte B365M Aorus Elite, Asrock Z390 Steel Legend, Asus ROG Strix B365-F

WINNER: **Asus ROG Strix B365-F**

The ROG Strix B365-F is a high end motherboard without the high-end price.



BEST BUDGET MOTHERBOARD – AMD

FINALISTS: Asrock X570 Phantom Gaming 4, MSI B450 Tomahawk Max, MSI X570-A Pro

WINNER: **Asrock X570 Phantom Gaming 4**

The Asrock X570 Phantom Gaming 4 offers a feature list that would be at home on a board costing $100+ more.

ADATA

BEST INTERNAL STORAGE MAKER

FINALISTS: Adata, Intel, Samsung, WD, Crucial, Team T-Force, Corsair, Kingston (HyperX), Seagate

WINNER: **Adata**

Back in the Australian market in a big way, with premium performance products at budget prices.

WD

BEST EXTERNAL STORAGE MAKER

FINALISTS: Seagate, WD, Adata, Samsung

WINNER: **WD**

The uniquely fast and versatile flagship WD Black P50, shows WD is committed to developing the external SSD market.

BEST HOME OR SOHO NAS

FINALISTS: QNAP QGD-1600P, Synology DS419slim, Synology DS1019+, QNAP TVS-672N, QNAP TVS-872N, Asustor AS5304T

WINNER: **Synology DS1019+**

Synology's latest iteration DiskStation Manager keeps it at the top of the market and the five bays and 8GB of RAM at an affordable price in the DS1019+ makes it the best buy.

PROUDLY PRESENTED BY CORSAIR

BEST VALUE CPU

FINALISTS: AMD Ryzen 5 3600, AMD Ryzen 5 3600X, AMD Ryzen 5 3400G, Intel Core i5 9400F, Intel Core i5 9600KF

WINNER: **AMD Ryzen 5 3600**

The AMD Ryzen 5 3600 redefines the mainstream CPU market bringing high performance computing within the reach of everyone.

BEST PERFORMANCE CPU

FINALISTS: AMD Ryzen 9 3900X, AMD Ryzen 9 3950X, Intel i9 10980XE, AMD Threadripper 3970X, Intel Core i7 9700KF, AMD Ryzen 7 3700X

WINNER: **AMD Ryzen 9 3900X**

The 3900X offers sensational performance across all workloads to go along with low power consumption and temperatures.

BEST VALUE LAPTOP OR 2-IN-1

FINALISTS: Aorus 15, Asus TUF Gaming FX505DU, Metabox Alpha-X NH58ED, Huawei MateBook 13, Acer Aspire 5 A515

WINNER: **Acer Aspire 5 A515**

The Acer Aspire 5 strikes a delicate balance between features and finances offering a solid CPU and a long battery life at a competitive price point.

BEST PREMIUM LAPTOP OR 2-IN-1

FINALISTS: Apple MacBook Pro 16, Gigabyte Aero 15 XA OLED, Huawei MateBook Pro X, Dell XPS 15 OLED, Lenovo Yoga C940, Microsoft Surface Pro 7, Asus Zenbook, Razer Blade Stealth 13 (2019), 14" Acer Swift 5

WINNER: **Apple MacBook Pro 16**

The new MacBook Pro 16's bigger screen, more immersive speakers, magic keyboard and superior thermal management system make it a stand out performer in 2019.

BEST GAMING LAPTOP

FINALISTS: Razer Blade Pro 17, Asus ROG Zephyrus SGX531, MSI GS75 Stealth 8SG, Razer Blade 15 Advanced

WINNER: **MSI GS75 Stealth 8SG**

The GS75 Stealth from MSI combined a powerful component set with a big screen, sleek form factor, generous battery, RAID 0 SSDs and a competitive price-point to take out this years best gaming laptop.

BEST DESKTOP PC BUILDER

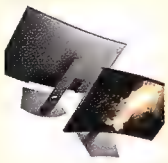
FINALISTS: HP, Corsair, Dell, Aftershock, Alienware, PC Case Gear, PLE, Scorptec, Mwave, TI Computers

WINNER: **Aftershock PC**

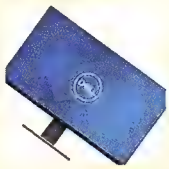
Stunning pro-modder-level craftsmanship and build quality for everyone.

BEST MEMORY MAKER
FINALISTS: Thermaltake, Team T-Force, Gigabyte, Adata, Crucial, Kingston (HyperX), Corsair, G.Skill
WINNER: **Team T-Force**
Consistently the best value through 2019.

BEST COOLING PRODUCT
FINALISTS: Thermaltake Floe DX RGB 360, Corsair Hydro Series H100i RGB Platinum 240 Special Edition in White, Deepcool Gamer Storm Captain 240 Pro, Asus ROG Ryuo 240
WINNER: **Corsair Hydro Series H100i RGB Platinum 240 Special Edition in White**
Corsair delivers system builders the option of a great-performing liquid cooler with manageable noise levels.



BEST GAMING MONITOR
FINALISTS: Samsung CRG9 (49"), Asus ROG Swift PG35VQ, Acer Predator X35, Gigabyte Aorus FI27Q-P, Samsung CRG5 (27"), Dell S3220DGF
WINNER: **Dell S3220DGF**
The Dell S3220DGF is an ideal jumbo monitor for users needing a practical work and high-performance gaming screen. With 165Hz, FreeSync 2 HDR, excellent contrast and accurate colour, it's well-suited for just about anything.

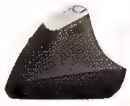


BEST PRODUCTIVITY MONITOR
FINALISTS: Samsung UHD Space Monitor (32"), Samsung WQHD Space Monitor (27"), Acer XR342CKP, Dell Ultrasharp U3219Q
WINNER: **Dell Ultrasharp U3219Q**
A bright and vibrant Ultra HD display with outstanding connectivity that is perfect all for workplace applications such as video-conferencing and data modelling.

BEST GAMING KEYBOARD
FINALISTS: Razer Huntsman Tournament Edition, Asus ROG Strix Scope, Corsair K70 RGB MK.2 SE Cherry MX Speed Special Edition in White, HyperX Alloy Origins, SteelSeries Apex Pro
WINNER: **HyperX Alloy Origins**
A stripped down gaming experience that dedicates itself to performance without wasting any space.

BEST PRODUCTIVITY KEYBOARD
FINALISTS: Satechi Aluminum Bluetooth Keyboard, Logitech MX Keys, Logitech Craft, Logitech K580 Slim Multi-Device, HP Pavilion 400 Wireless Keyboard
WINNER: **Logitech MX Keys**
Pairs with multiple devices and can control them all without fuss, and it's lovely to type on.

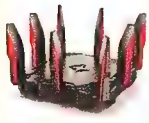
BEST GAMING MOUSE
FINALISTS: Razer Viper Ultimate, Corsair Ironclaw RGB Wireless Gaming Mouse, Asus ROG Gladius II Wireless, Razer Viper, Logitech G502 Lightspeed Wireless
WINNER: **Razer Viper Ultimate**
If you're a left-handed gamer who's looking to invest in something premium and wireless, the Razer Viper Ultimate is worth a look.



BEST PRODUCTIVITY MOUSE
FINALISTS: Logitch MX Vertical, Logitech MX Master 3, Steel Series Rival 710, Corsair Dark Core RGB SE, Razer Basilisk Essential
WINNER: **Logitech MX Vertical**
Innovative ergonomic design along with Logitech's usual high quality.

BEST GAMING HEADPHONES
FINALISTS: Razer Kraken Ultimate headset, Corsair Virtuoso RGB Wireless SE, Audeze Mobius, SteelSeries Arctis 1
WINNER: **Audeze Mobius**
Quite simply the best set of gaming headphones we've found in a long time, with a truly unique and powerful soundscape thanks to planar speaker tech and head-movement-based 3D positional sound.

BEST PC CASE
FINALISTS: Lian Li PC-011, Nzxt H710i, Corsair iCUE 465X RGB Smart Case, Cooler Master MasterBox Q500L, Lian Li Lancool II, Thermaltake Level 20 GT ARGB, Fractal Design Define S2 Vision
WINNER: **Nzxt H710i**
Nzxt's case has a layout that's second to none. You'll pay a premium for it, but it's worth the price.



BEST ROUTER
FINALISTS: TP Link Archer AX11000, Asus AiMesh AX6100 WiFi System (RT-AX92U 2 Pack), D-Link DIR-3060, Asus GT-AX11000, Netgear AX6000, DrayTek Vigor2926Lac
WINNER: **TP Link Archer AX11000**
Supreme AX11000 performance that exceeded our expectations. If you absolutely must have the best, then this is it.

PROUDLY PRESENTED BY SEAGATE

RESELLER

BEST ENTHUSIAST RESELLER
FINALISTS: PLE, PC Case Gear, Scorptec, Mwave, JW, TI Computers, Umart, AusPCMarket, AfterShock PC
WINNER: **PC Case Gear**
A wide range of well-balanced aesthetically pleasing systems combined with a fast website with the latest in hardware always available.

JB HI-FI

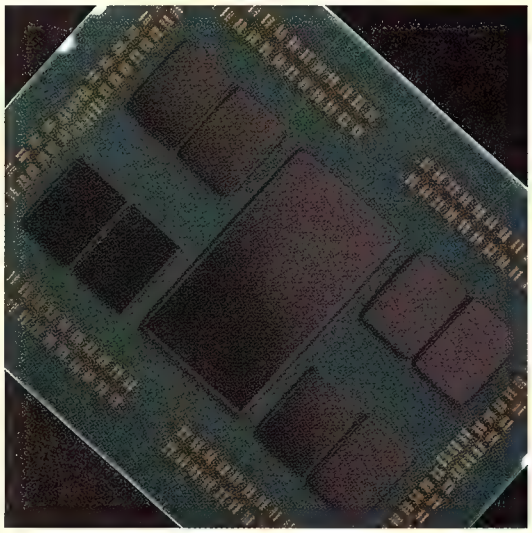
BEST CONSUMER RESELLER
FINALISTS: JB Hi-Fi, Officeworks, Bing Lee, Good Guys, Kogan, Harvey Norman
WINNER: **JB HI-FI**
Enormous range and variety of tech products and PC gear.

EXCELLENCE AWARD

For the person, product or technology that advanced the PC more than any other in 2019.

FINALISTS:
Nvidia RTX
AMD Ryzen 3rd-gen CPUs
Intel Ice Lake 10th gen mobile CPUs
AMD Zen 2 chiplet architecture
TSMC's 7nm process
Phison PS50 series SSD controllers
OLED screens
Wi-Fi 6
Intel Project Athena

WINNER:
AMD Zen 2 chiplet architecture
Set the foundation for an unprecedented disruption in CPU pricing and performance – the effects of which will be seen for many years – and is the most significant and impactful evolution in PC CPU design since the first dual-core desktop processor in 2005, pushing single processors to 64 cores and beyond.



GOLD AWARD

The Gold Award is given to the company deemed to be the very best of 2019. To stand out in a field of such spirited competition, in the ever-evolving cauldron of PC tech, requires a team that has focus, talent, fresh thinking and the ability to deliver. Winning is the mark of a team that has it all.

Taking home the Gold is an honour its winner can be especially proud of – and that's because it is you that decided this one. Voting has been running across our sites and we hope you had your say!

WINNER: Asus
Consistent quality, range and innovation across a huge variety of categories. Asus wants to be number one at everything it does, and its untiring efforts lead to great choice for consumers, and drives the industry forward.

ASUS

AUSTRALIAN PC AWARDS

THE AUSTRALIAN PC AWARDS ARE PROUDLY PRESENTED BY

CORSAIR SEAGATE

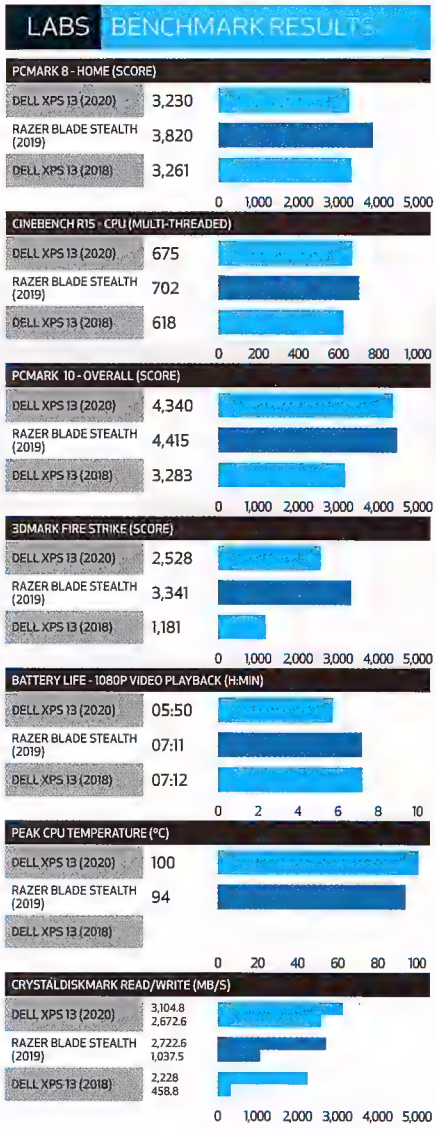
CO-PARTNERS

ASUS GIGABYTE QNAP tp-link

RAZER AMD logitech SAMSUNG

LAPTOP

$2,899 | DELL.COM


LABS BENCHMARK RESULTS
PCMARK 8 - HOME (SCORE)
DELL XPS 13 (2020) 3,230
RAZER BLADE STEALTH (2019) 3,820
DELL XPS 13 (2018) 3,261
0 1,000 2,000 3,000 4,000 5,000
CINEBENCH R15 - CPU (MULTI-THREADED)
DELL XPS 13 (2020) 675
RAZER BLADE STEALTH (2019) 702
DELL XPS 13 (2018) 618
0 200 400 600 800 1,000
PCMARK 10 - OVERALL (SCORE)
DELL XPS 13 (2020) 4,340
RAZER BLADE STEALTH (2019) 4,415
DELL XPS 13 (2018) 3,283
0 1,000 2,000 3,000 4,000 5,000
3DMARK FIRE STRIKE (SCORE)
DELL XPS 13 (2020) 2,528
RAZER BLADE STEALTH (2019) 3,341
DELL XPS 13 (2018) 1,181
0 1,000 2,000 3,000 4,000 5,000
BATTERY LIFE - 1080P VIDEO PLAYBACK (H:MIN)
DELL XPS 13 (2020) 05:50
RAZER BLADE STEALTH (2019) 07:11
DELL XPS 13 (2018) 07:12
0 2 4 6 8 10
PEAK CPU TEMPERATURE (°C)
DELL XPS 13 (2020) 100
RAZER BLADE STEALTH (2019) 94
DELL XPS 13 (2018)
0 20 40 60 80 100
CRYSTALDISKMARK READ/WRITE (MB/S)
DELL XPS 13 (2020) 3,104.8 2,672.6
RAZER BLADE STEALTH (2019) 2,722.6 1,037.5
DELL XPS 13 (2018) 2,228 458.8
0 1,000 2,000 3,000 4,000 5,000

Dell XPS 13

Dell's new XPS 13 goes big on screen real estate, but is this long term ultrabook leader a little big for its boots?

The XPS range is considered by many to have been the class-leading ultrabook for years now and it isn't hard to see why. The most striking feature on the XPS 13 is undoubtedly the screen. Dell caught on early to the impact small bezels can make on the overall aesthetic of an ultrabook, and the infinity edge display looks more elegant than ever on the 2020 XPS 13. Key to this is the reduction of the bezels even further to make room for a 13.4-inch screen that adopts an all new 16x10 screen ratio. At 500 nits the anti-glare display is 25% brighter than its predecessor and the 4K resolution is crystal clear, making it excellent for work and media playback.

The lack of bezels on all sides of the display means the laptop's footprint is the same as an 11-inch laptop, but Dell has nicely spaced the XPS 13 keyboard and included keys with firm resistance and a relatively good travel distance. There is an unusual rubberiness to the keyboard which combines with the tougher keys for a quiet typing experience, but it's sticky enough to feel a little constraining when typing. The touchpad on the other hand is one of the most responsive we've used and while we'd prefer it to be a little wider, it takes the cake as our favourite on a Windows-based laptop.

You can configure the XPS 13 with either an Intel Core i5-1035G1 or an i7-1065G7, eight or 16GB of RAM and a 256GB, 512GB or a 1TB PCIe-connected SSD. These new models start at $2,899 and range up to $4,299. We tested an i7/16GB/512GB model that sells for just under four grand on Dell's website, but we saw the same model available for $3,799 on some third-party stores.

The new XPS 13 offers around a 5% CPU performance bump over its predecessor, which we found surprising since it has the same cores and the clock speed range was lower, but we found the new Intel Iris Plus Graphics GPU performed between 14 and 76% better across all our graphics tests. Battery life was around the same as last year's XPS 13 with the 51Wh lithium-polymer battery, managing four hours and nine minutes in the PCMark 8 Home Battery benchmark. This equates to only five hours and 50 minutes in the 1080p movie playback battery test, but if you reduce the screen resolution you may be able to stretch that out to a full day's working.

With read and write speeds of 3,104 and 2,672MB/s respectively the NVMe storage is some of the fastest available and the 2020 XPS 13 comes with a new Killer Wi-Fi 6 AX1650s chip so you can utilise the latest Wi-Fi spec.

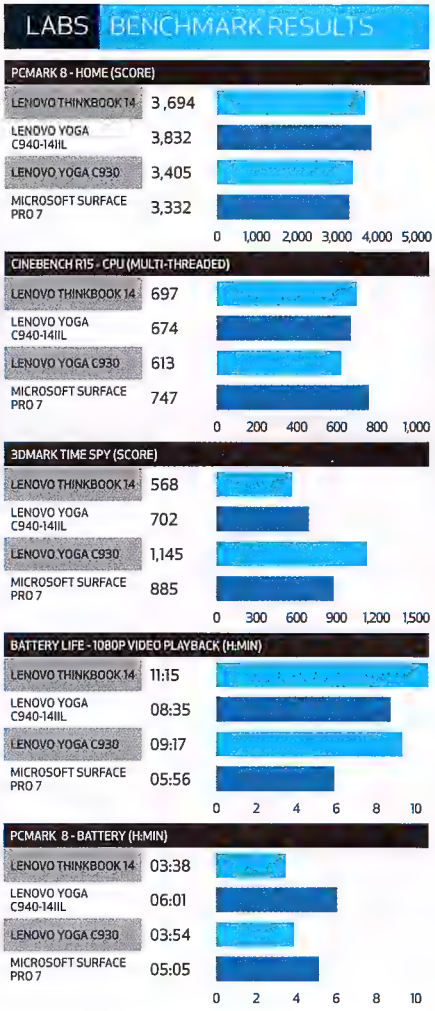
The exterior clamshell is made from solid metal providing ample protection while the keyboard surround is built from the trademark XPS carbon fibre wafer that we suspect helps to keep the weight to 1.27kg and any excess thermal energy away from your hands. Dell knows this device is top of the game, so expect to pay a premium for the latest models. You can buy a similarly specced MacBook Air for $2,449, so there are naturally much better deals to be had out there. **Joel Burgess**

Verdict

The best windows ultrabook out there, but you'll pay a premium for that privilege.

LAPTOP

$2,033 | LENOVO.COM/AU


LABS BENCHMARK RESULTS
PCMARK 8 - HOME (SCORE)
LENOVO THINKBOOK 14 3,694
LENOVO YOGA C940-14IIL 3,832
LENOVO YOGA C930 3,405
MICROSOFT SURFACE PRO 7 3,332
0 1,000 2,000 3,000 4,000 5,000
CINEBENCH R15 - CPU (MULTI-THREADED)
LENOVO THINKBOOK 14 697
LENOVO YOGA C940-14IIL 674
LENOVO YOGA C930 613
MICROSOFT SURFACE PRO 7 747
0 200 400 600 800 1,000
3DMARK TIME SPY (SCORE)
LENOVO THINKBOOK 14 568
LENOVO YOGA C940-14IIL 702
LENOVO YOGA C930 1,145
MICROSOFT SURFACE PRO 7 885
0 300 600 900 1,200 1,500
BATTERY LIFE - 1080P VIDEO PLAYBACK (H:MIN)
LENOVO THINKBOOK 14 11:15
LENOVO YOGA C940-14IIL 08:35
LENOVO YOGA C930 09:17
MICROSOFT SURFACE PRO 7 05:56
0 2 4 6 8 10
PCMARK 8 - BATTERY (H:MIN)
LENOVO THINKBOOK 14 03:38
LENOVO YOGA C940-14IIL 06:01
LENOVO YOGA C930 03:54
MICROSOFT SURFACE PRO 7 05:05
0 2 4 6 8 10

Lenovo ThinkBook 14

Lenovo's latest business laptop is clearly thinking about the account book.

The ThinkBook 14 range from Lenovo is pitched at small business employees or anyone who is willing to accept a little more bulk in their ultrabook to avoid a flagship's premium price tag. This doesn't mean that the ThinkBook 14 isn't suitably powerful however, in fact, if you're looking at performance over cost then this unit offers similar performance to a Yoga C940 for around $900 less, which is a pretty compelling reason for the business-minded to take note.

For this price cut you will have to be willing to sacrifice on total battery capacity and the screen on the ThinkBook 14 is one of the dullest we've seen in a while, but the 250nit FullHD non-touch display is at least usable if turned to 100%. And while the exterior is aluminium, the keyboard surround is coated in a thin brushed metal veneer to save on both weight and cost.

Aesthetically the keyboard and trackpad are nice enough, but the touchpad isn't the silkiest and the keyboard is on the shallower side. Considering it's designed to be a price conscious device these elements are perfectly serviceable and shouldn't bother too many, but it is nice to see Lenovo has included a fingerprint sensor directly on the physical power button and a super speedy PCIe SSD, which will be appreciated perks for efficient business users.

The SD web camera is placed on the top of the screen making it good for video web conferencing and the dual array mic and Harman Kardon speakers mean the audio is clear for calls and media. While some US models advertise Wi-Fi 6, local units seem to be fitted with a, 802.11ac Realtek 8822CE Wireless network controller without ax capacity, so don't expect cutting edge wireless connectivity (although there does seem to be Bluetooth 5 included).

You can configure the ThinkBook 14 to have a Core i5-10210U CPU, 8GB of RAM and a 256GB Samsung SSD for just $1,399 from third party sellers locally. The model we tested was a little more powerful containing an Intel Core i7-10510U CPU, 16GB of RAM and a 512GB PCIe SSD which retails for $2,033, but we've seen as low as $1,853 from third parties. In the majority of our CPU benchmarks the ThinkBook 14 was within a few percent either way of the Yoga C940-14IIL ($2,899), which uses an Intel Core i7-1065G7. The Yoga C940 chip does have a Intel Iris Plus Graphics GPU, which performed between 19% and 55% better than the discrete AMD Radeon 625 chip in the ThinkBook 14. Weirdly the integrated Intel UHD Graphics performs close to 30% better on Geekbench 4 Open GL compute tests, which makes its inclusion a little baffling.

The CPU on the ThinkBook 14 trades efficiency for power which makes it great value, but the higher 1.8GHz clock rate burns through power a little quicker than flagship ultrabooks. In PCMark 8 the ThinkBook 14 only scored three hours and 38 minutes... which may just scrape in at a full day of light document editing and web browsing. Because of the dull screen the device actually did pretty well in our 1080p media playback test, netting 11 hours and 15 minutes, but since you can barely see the screen at the 50% brightness we tested at, we'd take at least a few hours of this for a comfortable viewing experience. ■ **Joel Burgess**

Verdict

A powerful workhorse that is a little thicker and has a dull screen, but is great value for it.

★★★★☆

GAMING MONITOR

$2,399 | ASUS.COM/AU

Asus ROG Swift PG43UQ

Asus' large format 43-inch 4K G-Sync monitor has been cranked up to 144Hz, but can this gaming display really do everything your TV does and more?

Whether it's the introduction of HDR colour, the opening up of compatibility between Nvidia's GeForce cards and AMD Freesync compatible screens, or the faster and faster refresh rates, it's a pretty awesome time to be buying a PC display. It's perhaps even better for those considering a living room PC. Take the new Asus ROG Swift PG43UQ as an example. In addition to being TV-large at 43-inches, it's also one of the first monitors we've seen to get a Vesa DisplayHDR 1000 certification, which means it has been independently tested to be able to reproduce a wide colour gamut at a peak brightness of 1000 nits (the level that is generally required for TV HDR labeling). This brightness level isn't usually needed on monitors because you sit so close to them, but 1000 nits means the screen will look vibrant from anything over 1.5 meters away. Combine this bright 90% DCI-P3 colour gamut with the 4K resolution and you have a truly groundbreaking living room PC display that will look great whether you are working or gaming.

Naturally this large format 16x9 screen is best suited to gaming... and for many styles of online competitive titles the most critical thing will be refresh rate and latency. Early data from Nvidia has shown that there is a strong correlation between refresh rates of monitors and overall kill-to-death ratios, so high hertz is critical. The PG43UQ is also one of the first 4K screens we've seen to offer a 144Hz refresh rate with sub 1ms MPRT latency. While we see screens at FullHD running at up to 240Hz, in 4K the transfer load is so demanding that it actually outpaces the maximum rate of transmission for the DisplayPort 1.4 interface – an issue that required Asus to utilise Display Stream Compression (DSC) to push it through a single DP1.4 cable.

In addition to all its other features the PG43UQ also includes Nvidia's G-Sync technology to ensure you don't get any screen tearing or ghosting, even when running at 144fps. An Nvidia RTX 2070 Super can only run *The Division 2* in 4K at 35 fps, so 4K 144Hz is really futureproofing your unit since even a 2080 Super isn't likely to get over 60fps at 4K on modern titles. Of course anyone needing to be competitive can pull that resolution down to FullHD to take advantage of faster frame rates, which gives you the best of both worlds... but be warned, you are paying a premium for the luxury to choose between these elite display modes.

If you don't feel the need to buy a screen that will have everything you'll need for the next few years of PC component upgrades you can get Asus's smaller, not as bright ROG Strix XG438Q 120Hz Freesync monitor for about $900 less, which is one of the most amazing deals we've seen going for a large format gaming screen.

While we could've used a bit more space for cables in the concealed rear panel, the two DisplayPort 1.4 and two HDMI 2.0 sockets provided enough connectivity and both the rear Vesa mount and tabletop stand provide sturdy discrete support. The rear speakers are a good feature for quick set up, but they are a little quiet so you will want to use headphones or a soundbar for sound that matches. ■ **Joel Burgess**

Verdict

The PG43UQ has so many premium features that it'll future-proof your system for years to come.

★★★★½

THE
MOST FUN
YOU CAN
HAVE WITH
YOUR HANDS
WITHOUT
GOING
BLIND

games radar.
MORE KICKS PER CLICK

apc RECOMMENDS

ROUTER

$379 | WWW.ASUS.COM/AU

Asus RT-AX3000 Wi-Fi Router

Asus offers up the first, fully-featured, affordable Wi-Fi 6 router.

We've been reviewing Wi-Fi 6 routers, which utilise the latest 802.11AX standard, for a year now. However, while we've been devilishly impressed with the performance they afford, we've been less than impressed with their affordability. Asus' new RT-AX3000 is very small and traditional looking compared with previous devices but it's fully featured, supports Wi-Fi 6 and costs less than competitors. So, should you buy it?

At first glance the RT-AX3000 might seem a little dull, but in a world of oversized spaceships and robot spiders, we welcome some normality. Set-up is performed either via a web browser or Asus' mobile app. While the latter is simple and straightforward, the browser does rather overcomplicate things. Nonetheless, we had the internet up and running quickly.

The 3000 denotes a theoretical top speed of 3,000Mb/s spread across two bands – one on 2.4GHz and one on 5GHz. You can set them up as separate networks or, as we much prefer, have them appear as one single network and allow the technology to invisibly choose the best connection – these days we're confident that it knows best.

We performed our standard Wi-Fi tests in a three-storey Sydney town house by downloading large video files from a Synology DS1019+ NAS to a Wi-Fi-6-equipped Dell XPS 15 OLED laptop. Next to the router, speeds hit an incredible 754Mb/s. While this is still some way off Wi-Fi 6's theoretical maximum of 2,402Mb/s it's more than 100Mb/s faster than any Wi-Fi device we've ever tested. An Asus insider told us, "Under the low-profile look is a wolf in the sheep's clothing. Rated for AX3000 connectivity, it actually features significantly more processing power than what we have on paper." Sadly, the diminutive size dropped off quickly as we climbed floors. One floor up it dropped to 98Mb/s while two-floors up it fell to 89.7Mb/s. The latter two scores aren't particularly slow for internet streaming, but we can't help be a little disappointed.

As usual, Asus packs in the features, one of which is AiMesh: a technology that makes adding additional Asus Wi-Fi products, to form a mesh, very simple. AiProtection comes via Trend Micro and offers, regularly-updated network security and Parental Controls. AiCloud offers server functionality to any storage connected to the USB 3.1 Gen. 1 port. This can work across the internet or simply over the LAN. Other apps allow the port to be used with a printer, 4G USB dongle and a Download Manager which lets you share torrents without a PC. QoS lets you choose which applications get prioritised and all the usual networking options (including Port Forwarding) are available.

Pricing is strange as we've seen it range from over $500 down to $379. While the latter is preferable, it's not exactly cheap in the world of routers. Nonetheless, it's still considerably cheaper than our favourite, TP-Link Archer AX6000 which offers excellent performance and far-superior range and has only dropped to $499. However, if you live in a small residence, want the features and could use the blistering, up-close speed, it represents a good, high-performance buy.

■ Nick Ross

Verdict

Great features, a good price and blistering short-range speed are marred by performance dropping at distance.

★★★★½

ROUTER

$549 | WWW.ASUS.COM/AU

Asus ZenWiFi

Simple setup, decent features and superb performance make this good-looking system very attractive.

Last year, we drooled over Asus' RT-AX92U Wi-Fi-6-based mesh, which resembled two small routers, connected over a 5GHz backhaul connection, that could provide a single, Ethernet-like internet connection all over the house. We loved the bombproof reliability and speed it offered to everything that connected to it. Now here's a cheaper AC version which is more consumer friendly in terms of looks, price and setup. How does it fare?

We think this might be the simplest device setup we've ever experienced (which is saying something with Wi-Fi). After downloading the partner app, the phone found the router and connected to it without us doing anything. It asked for Wi-Fi network names and whether we wanted two separate 2.4GHz and 5GHz bands or use one, combined network and then it just worked. To join the second node, we had to power it on within three metres of the first device, click "Search" and everything synchronised. We then moved it two floors up to our gaming-room-cum-office and connected it to the PC which is normally connected to the primary router via a powerline adapter that achieves 90Mb/s performance. With the AX-based predecessor, the 4,804Mbps-rated backhaul connection saw this rise to a solid 386Mb/s: performance that prompted us to subsequently update our entire testing methodology.

The theoretical top speed is 3,000Mb/s spread across a 2.4GHz and two 5.4GHz 802.11AC bands. We used our regular Wi-Fi test by downloading large video files from a Synology DS1019+ NAS to a Wi-Fi-6-equipped Dell XPS 15 OLED laptop in a three-storey Sydney town house. At close range it managed an excellent 503.2Mb/s. One floor up (between the nodes) scores fluctuated between 229.9Mb/s and 500Mb/s. On the top floor, near the second node, it fluctuated between 423Mb/s and 496Mb/s. Despite the occasional wobble with the top speeds, the connection itself never faltered and it was never slow. To double-check its reliability we also played a great deal of *Call of Duty* and found that ping and playability was consistent with wired performance.

Asus' phone app is simple to use and offers a great many monitoring and management options alongside the usual Wi-Fi offerings. You can quickly see what's accessing your network, block that access, or limit it. You can also group devices into easy-to-manage parental control groups. An 'Insight' tab offers tips regarding security and updates while Settings displays the usual Wi-Fi options including multi-faceted QoS and Port Forwarding. Asus' AiCloud takes care of content on USB-connected storage devices while AiProtection monitors network security and updates. Advanced features, similar to the RT-AX3000 (opposite page) are available via the web interface. Our only gripe is having a stingy three Ethernet ports on each node.

At $549 it's significantly cheaper than its older, big brother was at launch but that has now dropped in price to be only $50 dearer. However, while the Wi-Fi 6 variant is slightly more stable, few domestic users will need the extra speed, and the better looks and ease of management of the ZenWiFi will appeal to many.

Nick Ross

Verdict

Almost achieves perfection for demanding home users.

★★★★★

"4G routers can be a lifesaver to those cursed with poor NBN connections."

ROUTER

$350 | WWW.DLINK.COM.AU

D-Link 4G LTE Wi-Fi AC1200 Router DWR-956

A 4G router to support a mobile office or ropey NBN connection.

Last year we reviewed TP-Link's diminutive Archer MR600 4G router, which was designed to share 4G-internet across mobile offices. It worked so well that we ended up using it ourselves – as a full-time office telecoms hub – running three IP phones, a conference phone, a dozen Macbooks and 20 other devices. We resorted to such a setup because the only available internet connection in Manly (which is near the centre of Sydney) was ADSL or a silly-money, private cable service for several hundred dollars per month.

Indeed, we were also given a tip by tech journo Duro Sen, that 4G routers can be a lifesaver to those cursed with poor NBN connections. Sick of the unreliability and poor performance of his 'high speed' wired NBN line, he stopped wasting money by signing up to the cheapest NBN deal he could find and instead relied upon a 500GB 4G plan from Optus-reseller, Ovo, for $110 per month, to do the heavy lifting. While not cheap, when the internet is essential to your home or work, that's dramatically cheaper than relying on data plans from the main networks. Note, at the time of going to press, Ovo is only offering a 250GB plan due to coronavirus rationing.

With that in mind, we were keen to see D-Link's latest DWR-956 Router which offers 4G (in addition to Ethernet) WAN. There's also an RJ-11 phone port so you can directly connect a SIP phone – something that the TP-Link didn't have. Set-up is rather old-school; unlike TP-Link there's no phone app or mobile-optimised settings. You're first expected to use a browser-based wizard that walks you through setting up names and passwords for the 2.4GHz and 5GHz networks. It also asks you to enter all the manual details for the 4G WAN, which is disappointing as we expect automatic configuration nowadays. It's a theme that runs deep through the router's firmware; while there's the full array of consumer-grade features, many of them come with old-school, networking-engineer-grade jargon. QoS, for example, eschews the usual 'Gaming,' 'Streaming' and 'VoIP' settings for hardcore DSCP (Differentiated Services Code Point) code numbers. However, the most annoying UX aspect is that loading pages of the firmware takes almost 10 seconds each.

But what of its performance? Much will depend on the 4G network you're using, but we ran our standard speed tests across its dual-band, AC1200-rated (1,200 Mbps maximum theoretical speed) LAN anyway; transferring files from our Synology DS1019+ NAS to a Wi-Fi-6-equipped Dell XPS 15 OLED laptop. Up close it managed an impressive 417Mbps (5GHz) and 105Mbps (2.4GHz). One floor up these plummeted to 32Mbps and 8.5Mbps respectively while no connection was possible two floors up.

To be honest, we're rather disappointed by the DWR-956. While TP-Link's Archer MR600 also has limited range, it's $70 cheaper than the $350 D-Link, much easier to use (thanks to excellent phone app and firmware) and has some nifty monitoring tools too. Unless you absolutely need the SIP port, TP-Link's MR600 kicks its backside in almost every way. ■ Nick Ross

Verdict

The most disappointing product that we've reviewed from D-Link in years.

★☆☆☆☆

apc RECOMMENDS

GAMING MONITOR

$2,499 | WWW.ACER.COM.AU

Acer Predator CG7

An epic screen.

At this price, the Acer Predator CG7 is certainly one of the more expensive gaming monitors you can buy right now – but then it's also one of the largest (apart from those 65-inch Nvidia Big Format Gaming Display (BFGD) monitors like the HP Omen X Emperium 65).

However, when compared to 43-inch 4K TVs, like the Panasonic GX800, it's also pretty pricey, and many 40-inch 4K TVs can be had for half the price, and offer comparable visual quality, including HDR support.

What these sets don't offer, however, is the high refresh rates and gaming-centric features of the Acer Predator CG7. So, it's clear that this is a monitor that's aimed at people who want to game on a large TV, while also benefiting from tech usually found in gaming monitors. That's a tricky – and niche – market to go for, and if you're not careful, you can end up appealing to no one.

> "It's clear that this is a monitor that's aimed at people who want to game on a large TV, while also benefiting from tech usually found in gaming monitors."

The design of the Acer Predator CG7 is similar to what we've come to expect from Acer's Predator lineup of gaming peripherals, so you get some rather angular corners and RGB lighting that leaves you in no doubt that this is a product aimed at gamers. One rather nice touch is the icons on the stand that encourage you to store your game controllers there. The RGB lighting can be configured with preset lighting patterns, or set up to sync to your music and games, which is a nice touch.

Port-wise, the Acer Predator CG7 comes with three HDMI ports, two DisplayPorts, a USB Type-C port, four standard USB ports (two 2.0 and two 3.0) and a USB input, allowing you to turn the monitor into a USB hub. That's a good selection of ports, though it doesn't come with a TV tuner. That means, if you want to use the Acer Predator CG7 as a TV – and considering its size, you probably will – then you'll need to plug in a separate set-top box.

When it comes to performance, the Acer Predator CG7 is an impressive beast – though there'd have to be something seriously wrong if it wasn't at this size. Plugging it into our test machine, Windows 10 discovered and configured itself accordingly, though we did have to pop into the settings to find a level of scaling that works best considering the size of the screen.

The Acer Predator CG7 has HDR (High Dynamic Range) support in the form of VESA DisplayHDR 1000. This is a high-end implementation of VESA DisplayHDR which has a peak luminance of 1,000 cd/m2. While it's not up to the standard of high-end TVs that have HDR10+ and Dolby Vision, it's one of the better implementations of VESA DisplayHDR – and the fact that it has a very bright peak luminance means it's capable of vibrant images.

Matt Hanson

Verdict

A huge gaming monitor that brings certain features we'd expect to see in a gaming monitor to a TV-sized screen.

★★★★½

MONITOR

$1,959 | WWW.MSI.COM

MSI Prestige PS341WU

When 4K is not quite enough...

As first world problems go, the fact that it's hard to find a PC monitor with more than eight million pixels has got to be up there. But if you want a truly high density display, your options are limited.

Yes, you can choose from a huge array of 4K UHD monitors, but 4K doesn't automatically equal high DPI. Take a typical 32-inch 4K screen. That works out at 138 pixels per inch, not much higher than the circa 100 dpi that most flat panel monitors have offered for years.

You can, of course, achieve higher pixel density with the same resolution via a smaller panel. A 24-inch 4K monitor clocks in at a decent 184 dpi. But who wants to pay big bucks for a mere 24-inch monitor? Enter, at last, the MSI Prestige PS341WU. Its main claim to fame? A native resolution of 5120x2160, also known as 5K2K. That's three million more than the 3840x2160 4K pixel grid.

Applied to the PS341WU's 34-inch ultrawide panel, the result is 163 pixels per inch. Not quite Apple Retina standard, then, but a big upgrade compared to larger format 4K monitors. Of course, pixel density isn't the only thing this MSI monitor has going for it, which is just as well, given the premium price of around $2,000. You also get a very high fidelity Nano IPS panel from LG. MSI claims static contrast of 1,200 to one, but the PS341WU also supports VESA DisplayHDR 600, which requires local dimming.

As it turns out, the PS341WU's local dimming tech is about as rudimentary as it gets, with just 12 zones. But you do at least get support for HDR content, even if the specs suggest you can't expect a true HDR experience. In practice, that's pretty much how it plays out. The HDR support is more of interest from a content creation perspective than content consumption.

But that's OK, given the overall image quality on offer, which is pretty special. The Nano IPS is gorgeous. It's so vibrant, but so natural. The contrast and viewing angles are great, too, and MSI's default calibration is nicely executed. MSI has also included calibrated presets for the sRGB, Adobe RGB, and PCI-P3 color spaces, which is handy even if you'll still want to manually calibrate for really serious workflows. Oh, and for the record, MSI claims the Prestige PS341WU achieves 100 percent coverage of the sRGB gamut and 98 percent of DCI-P3.

Add the tight pixel pitch to the luscious panel quality and you have a feast for the eyes. This is also a flexible, user-friendly monitor, primarily thanks to the USB-C interface with support for charging. Once you've gone to single-cable USB-C, especially if you drive a laptop PC, you won't want to go back to multiple cables.

So, the MSI Prestige PS341WU is an all-around winner, then? Not quite. Size is part of the problem. At this price, 34 inches feels stingy. Build quality and styling are also issues. Some of the plastics used in the chassis are not befitting of a premium monitor. The same goes for the stand's cheap, sprayed base.

Styling is a subjective issue, of course, but the overall aesthetic is an odd mix of professional and gaming cues. MSI is, perhaps, not quite in its comfort zone operating in the pro display market, and it may take a few iterations to find its form. In the meantime, the Prestige PS341WU is a very fine display in need of just a little polish. ■ **Jeremy Laird**

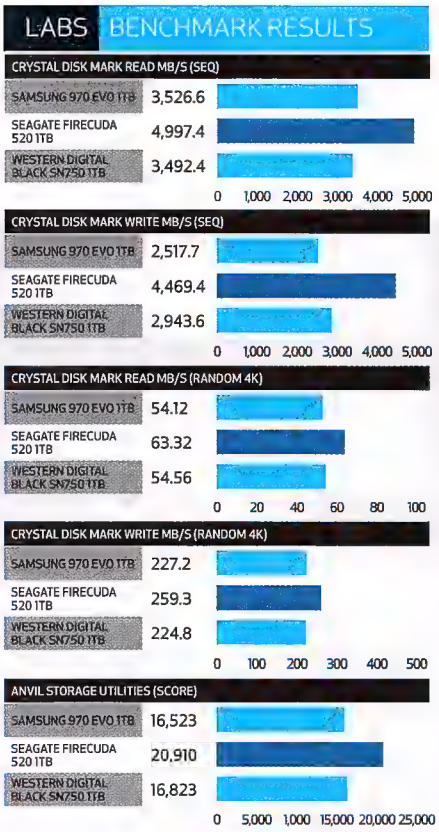
Verdict

Higher DPI than most monitors; gorgeous IPS panel.

★★★★½

SSD

$429 | WWW.SEAGATE.COM


LABS BENCHMARK RESULTS
CRYSTAL DISK MARK READ MB/S (SEQ)
SAMSUNG 970 EVO 1TB 3,526.6
SEAGATE FIRECUDA 520 1TB 4,997.4
WESTERN DIGITAL BLACK SN750 1TB 3,492.4
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CRYSTAL DISK MARK WRITE MB/S (SEQ)
SAMSUNG 970 EVO 1TB 2,517.7
SEAGATE FIRECUDA 520 1TB 4,469.4
WESTERN DIGITAL BLACK SN750 1TB 2,943.6
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CRYSTAL DISK MARK READ MB/S (RANDOM 4K)
SAMSUNG 970 EVO 1TB 54.12
SEAGATE FIRECUDA 520 1TB 63.32
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CRYSTAL DISK MARK WRITE MB/S (RANDOM 4K)
SAMSUNG 970 EVO 1TB 227.2
SEAGATE FIRECUDA 520 1TB 259.3
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ANVIL STORAGE UTILITIES (SCORE)
SAMSUNG 970 EVO 1TB 16,523
SEAGATE FIRECUDA 520 1TB 20,910
WESTERN DIGITAL BLACK SN750 1TB 16,823
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Seagate FireCuda 520 1TB NVMe SSD

Seagate's fastest SSD yet.

PCIe 4.0 SSDs have been trickling onto the market ever since the launch of AMD's X570 platform, though they remain very much enthusiast- and prosumer-oriented drives, at least until we see budget chipset support and, particularly support, on Intel platforms. Seagate is the biggest company yet to jump aboard the PCIe 4.0 train with its FireCuda 520 series SSD and its specifications look very tasty indeed, easily faster than the best PCIe 3.0 drives. At $429 for the 1TB model, it's definitely on the pricey side though. Is all the raw speed worth it?

The Seagate FireCuda 520 is a standard form factor M.2 2280 (80mm length) NVMe drive. In something that's rare among PCIe 4.0 drives, the FireCuda 520 doesn't come with a heatsink. This might seem like an oversight, but with almost all X570 and TRX40 motherboards coming with some form of integrated chipset and M.2 cooling, this actually makes perfect sense. Why include a cost-adding heatsink when most people will just remove it anyway?

It's equipped with Phison's commonly utilised PCIe 4.0 PS5016-E16 controller. It comes with 96-layer TLC NAND flash memory and a DDR4 DRAM cache. These specs are roughly equivalent to other PCIe 4.0 drives on the market right now. The 1TB FireCuda 520 comes with an endurance rating of 1,800 terabytes written, which is very good indeed. Seagate is obviously confident in the reliability of its 520 series. It also comes with a five year warranty.

As one of the world's leading storage manufacturers, Seagate's Seatools utility is highly regarded. It includes S.M.A.R.T. reporting, monitoring and firmware updating capability. You also have the option of downloading Seagate's DiskWizard cloning software.

When it comes to performance, the FireCuda 520 delivered some of the best performance we've seen from any NVMe drive, with the exception of some of the Optane drives, which are admittedly more expensive. Straight transfer rates are faster than any PCIe 3.0 drive on the market. Its random read and write performance is also stellar. With its onboard DRAM cache, most users should see the drive's full performance.

The Seagate FireCuda is a very strong contender from Seagate, though we're yet to see entrants from big players such as Samsung or Intel. The FireCuda's biggest competition comes from the likes of the Corsair MP600 and Aorus Gen 4 SSD's which can be had for slightly cheaper. They're all fairly similar in specification and performance. Which one you choose may come down to whether you need a heatsink or not.

If you're after one of the fastest SSD's on the market, and have a PCIe 4.0 motherboard, then the Seagate FireCuda 520 is a very good option, but it's just a bit too pricey to unequivocally recommend right now. It's got that very good endurance rating and with its PCIe 4.0 support, will remain useful in any system for many years to come. ■

Chris Szewczyk

Verdict

The FireCuda 520's performance is top shelf, but the competition is tough.

★★★★½

SSD

500GB, $279; 1TB, $399; 2TB, $799 | WWW.SAMSUNG.COM/AU

Samsung T7 Touch Portable SSD

Faster and even more secure.

Back in 2017, Samsung unleashed its third-generation T5 Portable SSD, instantly becoming a favourite amongst those who like their storage solutions to boast incredibly fast transfer speeds and secure encryption. Now, the South Korean manufacturer is offering its long-awaited follow-up in the Samsung T7 Touch Portable SSD, a device that manages to improve on a product that was already near-perfect.

Available in 500GB, 1TB and 2TB capacities, the T7 Touch's biggest selling point is undoubtedly the inclusion of a biometric fingerprint scanner for added security and convenience. The T7 Touch looks very similar to the T5 but is a tiny bit bigger and heavier. 85 x 57 x 8.0mm for a weight of 58g for the former and 74 x 57.3 x 10.5mm for a weight of 51g for the latter. The hardware needed for the biometric feature explains the gain in weight. The aforementioned fingerprint scanner can be found within an LED square that also lights up with a cool blue glow to keep the user informed of what the SSD is doing at a glance.

Upon plugging the platform-agnostic SSD in for the first time, you will find Samsung's Portable SSD Software 1.0 installation files already on the drive for Windows and Mac (along with a text file telling you where to download the Android version of the application). Once you've installed the appropriate version, you will be prompted to enable AES 256-bit hardware encryption via password and fingerprint ID. Once set up, you simply have to rest your finger on the scanner to unlock the SSD's read/write functionality the next time you plug it in. Sure, it's not exactly military-grade security we're talking about, but it should easily prevent anyone who isn't a world-class hacker from breaking into your drive.

Outside of the new fingerprint scanner, the biggest difference between the T5 and the T7 Touch can be found in Samsung's decision to swap the former's SATA-based SSD for an NVMe SSD behind the USB 3.2 Gen 2 bridge to offer significantly better performance. It is very likely that the T7 Touch uses sixth-generation 136-layer V-NAND as opposed to the T5's 64-layer V-NAND.

Samsung claims that the drive can achieve read/write speeds of up to 1.05GBps, which it says is about twice what the T5 could reach. In real life, we measured 1032MBps (read) and 924MBps (write) on CrystalDiskMark, which is not that far from Samsung's own readings.

The T7 Touch can't be touched (pun intended) when it comes to procuring the right balance between security, speed, portability and pricing. True, it doesn't have any of the military-grade security certifications that some of its more expensive rivals have, but at this price point, we're fine with that. Indeed, what Samsung has done with the T7 Touch is raise the baseline for securing your data on the move by adding biometrics to password protection. Others will surely follow suit swiftly – just don't expect them to beat the T7 Touch is on performance and on price.

Stephen Lambrechts & Desire Athow

Verdict

The Samsung T7 Touch is an exquisite piece of technology that offers great security and incredibly-fast data.

★★★★★

"It combines the plug and play ease of an external HDD with the connectivity options of a dock into a single unit that's connected via a Thunderbolt 3 cable."

DOCK

$599 | WWW.SEAGATE.COM

Seagate FireCuda Gaming Dock

A Thunderbolt docking station and external HDD in one.

Docking stations aren't anything new, and neither are external hard drives, but how about combining them both? That's exactly what Seagate has done with its FireCuda Gaming Dock. It combines the plug and play ease of an external HDD with the connectivity options of a dock into a single unit that's connected via a Thunderbolt 3 cable. We have to say, it looks really awesome too.

The FireCuda Gaming Dock is a somewhat unusual looking device. The majority of it is basically a drab looking box, but there's a stylised section that features RGB lighting, and the overall effect is a fantastic combination of subtlety and bling. It really does look like a sophisticated piece of kit.

It comes with a built in 4TB hard drive. Some users might question why there isn't an SSD included, but fear not. There's an M.2 slot that supports NVMe, so you can add one and enjoy fast, low latency storage combined with the hard drive for file storage. Gamers will appreciate the extra speed on offer from an SSD as opposed to typical external HDD.

The Gaming Dock connects via a Thunderbolt 3 cable. There's also a pass through for connecting other Thunderbolt 3 devices. It's powered by an external power adapter, so there won't be any problem powering a bunch of different devices.

These days, despite the increasing shift towards Type-C USB on compact laptops, people still use Type-A devices. The FireCuda dock comes with four USB 3.1 Gen 2 ports so there should be enough Type-A ports to cater for most users' needs. There's an additional USB port that supports charging which will come in handy for juicing up tablets and phones.

You also get a gigabit Ethernet port. This is something that very few ultra-thin models have due to the height of the port. WiFi has come a long way in recent years, but you can't beat the reliability of a good old LAN connection if you have the option.

Additionally, there's a pair of 3.5mm audio in and out ports and a particularly welcome DisplayPort 1.4 connector. This will be an essential feature for users wanting to send their laptop's output to a monitor.

Setting up the FireCuda dock was as simple as plugging in the unit. All the ports were recognised without requiring any extra setup or driver installation. You should download Seagate's Toolkit software which includes functionality including backups and RGB control. We also noted the RGB lighting is very bright, but thankfully you can dial it down a bit.

Our impressions of the FireCuda Gaming dock only got better as we tinkered with it. It provides a comprehensive set of ports and flexible storage that's incredibly simple to use. It's the kind of device that will seem like a total system upgrade, without having to actually upgrade the system. If you've got a Thunderbolt 3 equipped laptop, then it should have something that you'll take advantage of. Gamers, professionals and enthusiasts will find the FireCuda Gaming dock does a little bit of everything, and it does it with a touch of class too. **Chris Szewczyk**

Verdict

Seagate's FireCuda Gaming Bock is a terrific one box way to add additional storage and connectivity options.

software

» APPS FOR ALL YOUR PLATFORMS

Windows SOFTWARE

The best free email clients

Replace Windows Mail and manage all your emails.

eM Client

Easy to use, with many features.

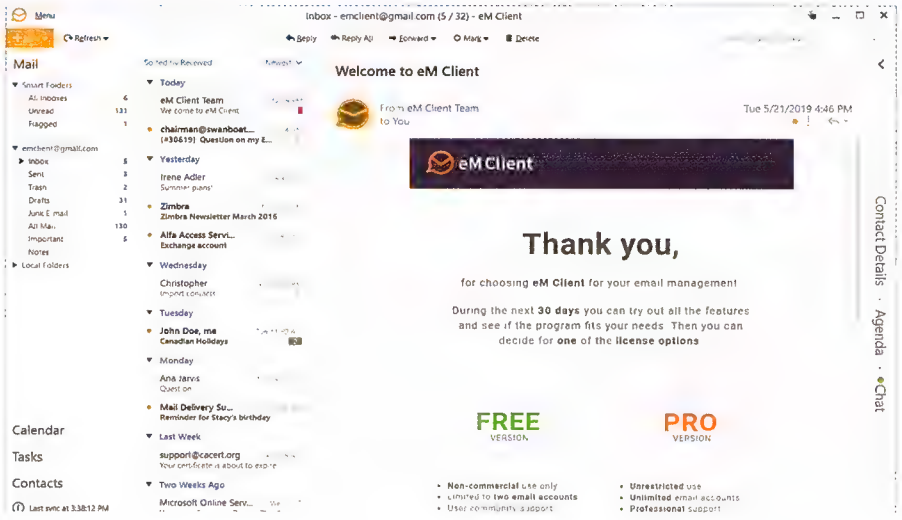
FREE | WWW.EMCLIENT.COM

eM Client has been around for nearly 10 years now, and throughout that long development has evolved into the best free email client for Windows.

The app makes it easy to migrate your messages from Gmail, Exchange, iCloud and Outlook.com – just enter your email address and the client will choose the appropriate settings for you. eM Client can also import your contacts and calendar. It's easy to deselect these options if you manage them separately.

eM Client is also packed with options such as automatic translation, delayed sending and encryption. It's a remarkable set of tools, and for managing two email accounts, it's ideal.

If you have more accounts, it's well worth upgrading to eM Client Pro for a one-off fee. This lets you connect an unlimited number of accounts, access VIP support and use the email client commercially.


Inbox - emclient@gmail.com (5 / 32) - eM Client
Welcome to eM Client
eM Client
Thank you,
for choosing eM Client for your email management
During the next 30 days you can try out all the features and see if the program fits your needs. Then you can decide for one of the license options
FREE
VERSION
PRO
VERSION
Calendar
Tasks
Contacts
Contact Details · Agenda · Chat

An integrated chat app supports common platforms including Jabber and Google Chat.

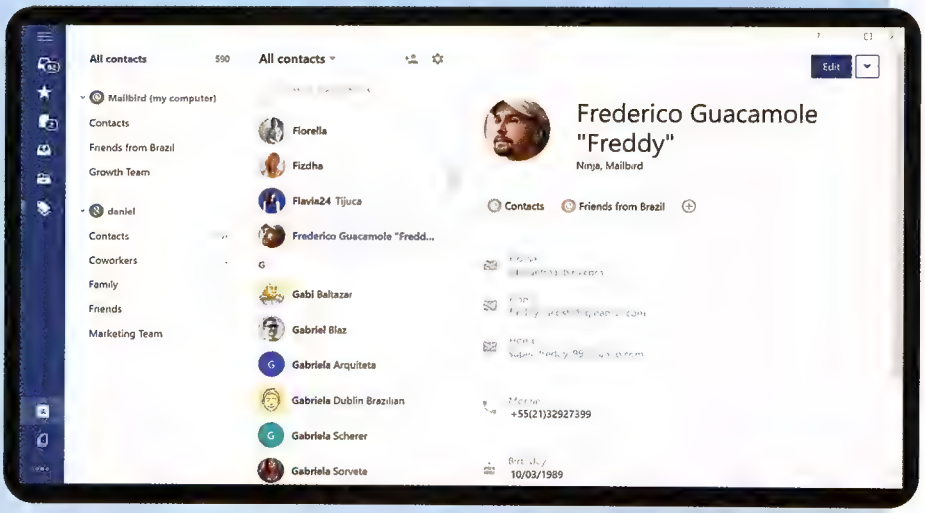
Mailbird Lite

FREE | WWW.GETMAILBIRD.COM

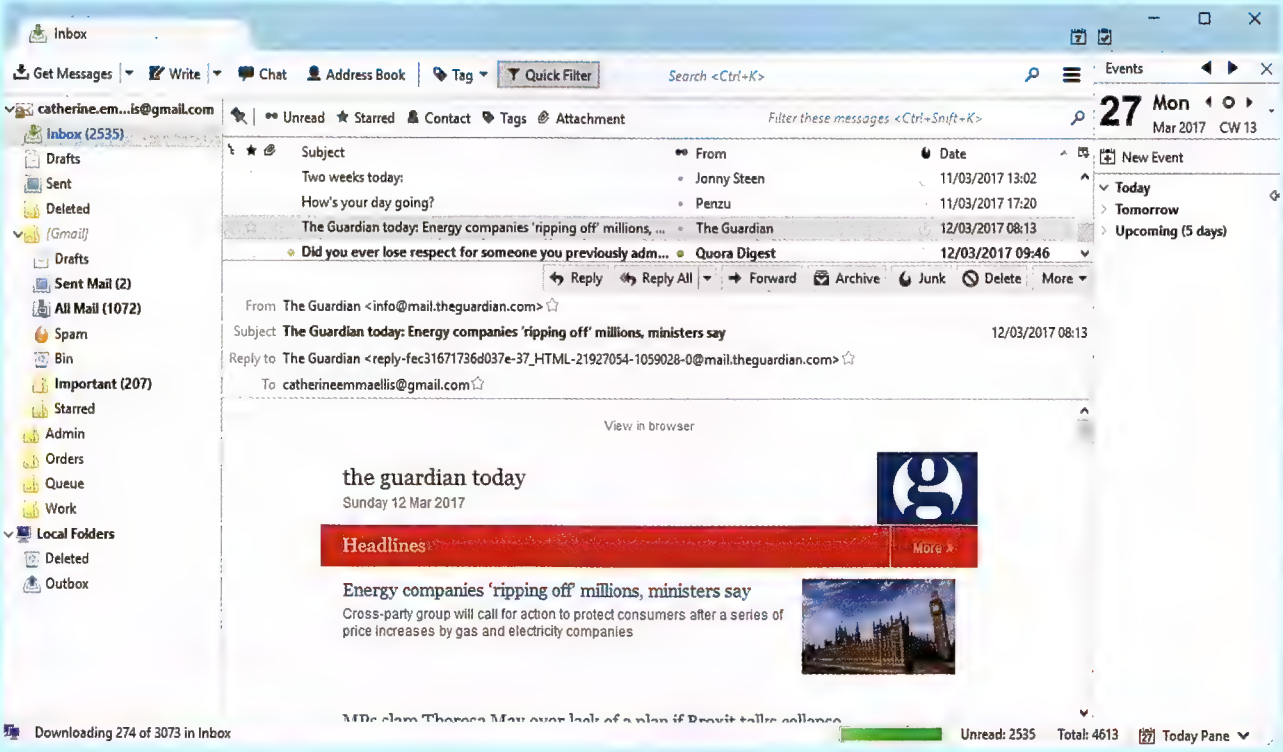
Mailbird Lite is a communication platform to which you can add apps for scheduling, chatting, file syncing and teamworking.

Free users miss out on features such as speed reading, email snoozing and quick previews of attachments, but Mailbird Lite is still an excellent choice. It's optimised for speed, and looks great too. The only real downfall is that it only supports three email accounts, but if that's not a problem for you, this is one of the finest free email clients around.

Setup is simple; enter your email details and Mailbird Lite will find the necessary settings, then get to work importing your messages. It offers to connect with your Facebook account, so it can liven up your inbox with your contacts' profile photos, and can also link with Whatsapp, Google Calendar, free task manager Moo.do, and teamworking app Asana. Exploring the Apps menu provides a raft of other options, including Twitter, Trello and many more.



Mailbird's layout is customisable, with free colour themes.



Thunderbird also supports multiple calendars, to keep on top of appointments.

Mozilla Thunderbird

FREE | WWW.THUNDERBIRD.NET

Thunderbird, from Firefox developer Mozilla, has just undergone a total overhaul that brings it right up to date. Not only does it look smarter, it also works much better. You no longer need to download and configure an extension to make full use of your calendar, and cutting, copying and deleting events is effortless. It also lets you keep a backup of all your messages on your PC.

You can connect as many email addresses as you like to Thunderbird, and it's totally free, with no ads or prompts to upgrade. It's also very flexible, with a wealth of customisable options – and if you can't see a particular feature, you can expand Thunderbird with extensions.

Thunderbird still takes a little getting used to (there are so many options, the interface is a little confusing at first), but it's a superb email client that'll serve you well – particularly if you have lots of accounts to manage.

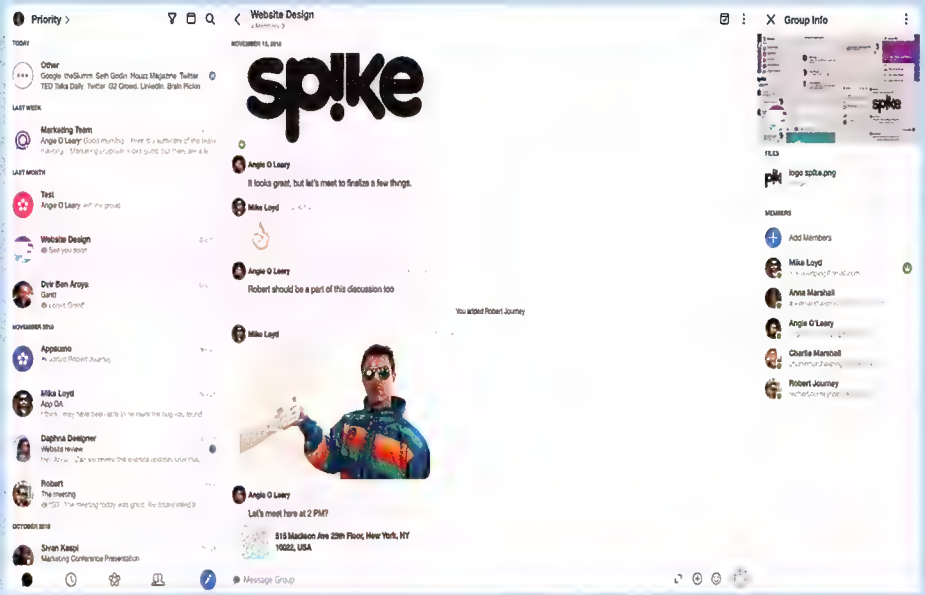
Spike

FREE | WWW.SPIKENOW.COM

Spike is a versatile free email client, available for iOS, Android, Windows and Mac, with a handy web app for those occasions when you don't have time to spend installing software.

It's billed as the first 'conversational' email app, which essentially means it presents messages and replies in bubbles in real time, in a style that looks very much like WhatsApp. This works particularly well for the type of short emails that you're likely to send to friends and family, making it refreshingly simple to keep track of long email chains that would usually be a mess of nested messages.

Spike is free for personal use, with support for an unlimited number of email accounts and up to 10 'group chat rooms'. If you're sick of messy lists of replies, it's certainly a breath of fresh air.



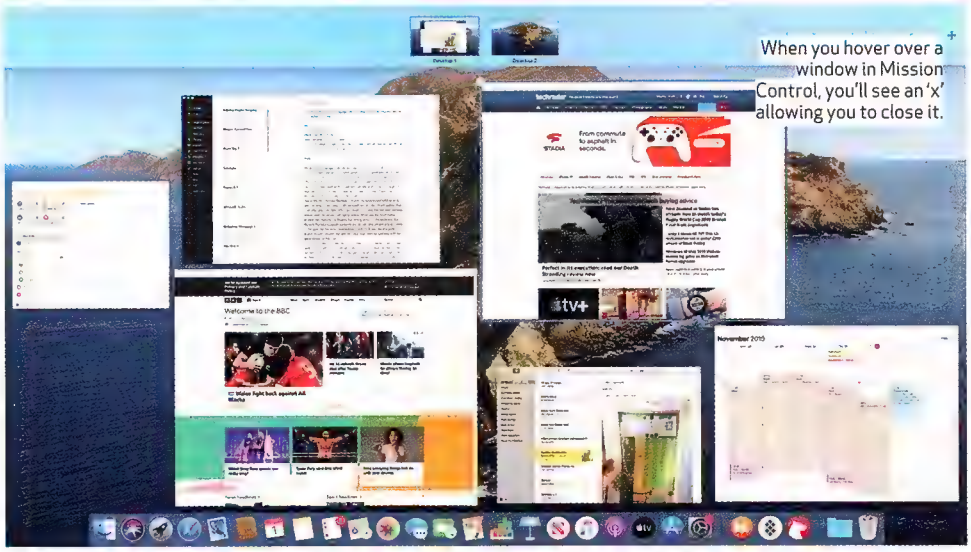
Spike strips away the unnecessary parts of email.

Mac » APPS

Mission Control Plus

Mission Control gets more useful.

US$9.99 | FADEL.IO
NEEDS MACOS 10.13 OR LATER



When you hover over a window in Mission Control, you'll see an 'x' allowing you to close it.

Mission Control; you either swear by it or never use it. For users of Macs with large screens especially – where it's more likely there will be lots of apps running and windows open – it makes it easy to cut through the clutter.

However, Mission Control, useful though it is, isn't perfect. And, sadly, Apple has done little to add to its features over the years. Step forward Mission Control Plus. This handy little app makes Mission Control even more useful, allowing you to close windows while they're all still displayed on screen. It also has a handful of keyboard shortcuts so you can hide windows, open apps, or quit them quickly.

In use, Mission Control Plus is deceptively simple. When launched, it sits in the menu bar. Invoke Mission Control and hover over a window; you'll see an 'x' in the top-left corner, indicating that you can close it. And the five keyboard shortcuts can be toggled on or off from the menu bar.

That's all that Mission Control Plus does. If you use Mission Control, you'll see just how much more useful MCP makes it. If you don't use it because of its limitations, this app may be enough to persuade you to try it again. ■

Kenny Hemphill

Jenny LeClue – Detectivu

Charming murder-mystery puzzler.

$28.95 | JENNYLECLUE.COM | NEEDS MACOS X 10.8 OR LATER

Jenny LeClue is an intrepid young detective with a knack for solving crimes. The invention of a troubled author of failing detective fiction, Jenny must embark on a thrilling advenure, with her trusty journal and magnifying glass in hand.

Set in the picturesque small town of Arthurton, the game wins hearts with its gorgeous, colourful art style. From its sun-drenched campus and cosy living rooms to its creepy night-time vistas, this is a truly beautiful platform game.

Jenny steals the show, supported by likeable secondary characters and excellent writing. Though a little slow to start, gameplay is fun and the story interesting, aided tremendously by Jenny's endearing personality and a generous helping of humour. If you liked point-and-click style *Day of the Tentacle*, you'll love *Jenny LeClue*.

The only issue is that the controls are designed for controllers and don't make use of your mouse; the game could be better optimised for keyboard players. But we're being picky – really, you won't mind when everything else is so good. ■

Alex Blake

You'll find yourself gawping at the gorgeous graphics…

Night Sky 7

See the stars and planets up close.

FREE, OFFERS IN-APP PURCHASES | ICANDIAPPS.COM | NEEDS IOS 11 OR LATER

There's no shortage of iOS apps for stargazers, but Night Sky is one of the oldest and one of the most impressive. Version 7 adds a host of new features, including a new AR app for Apple Watch Series 5 that uses that device's built-in compass, enabling you to take Night Sky Live tours on the watch.

Perhaps the biggest improvement in version 7 is to Sky View, which has 60 million more stars; eight-times higher resolution for light spectrum textures; sunrise/sunset effects; and a new daylight mode. There's also a brand new interface that looks fantastic and has a new search mode that enables you to filter searches based on the type of celestial body you're looking for, as well as a Quick Find mode. Plus, there's a new planetarium feature designed in conjunction with the Adler Planetarium in Chicago. And you can now view the internal structures of planets, as well as test your knowledge of the night sky with a quiz that supports Apple's ClassKit, so teachers can keep track of students' scores.

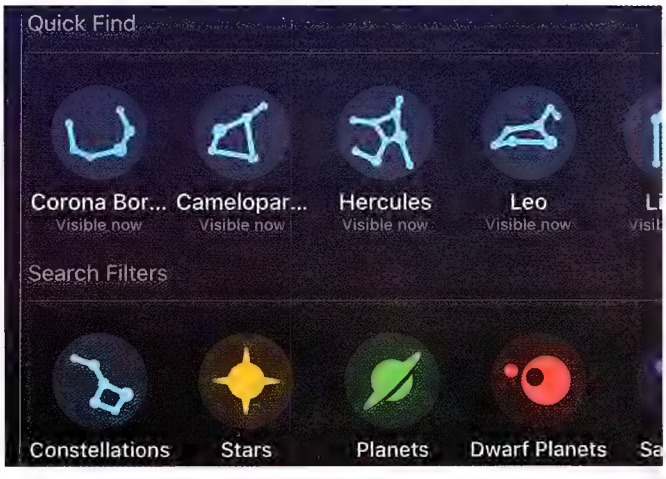
SKY-HIGH UPGRADE

There are a couple of new premium features, too. One of them alerts you to when the Aurora Borealis is most visible and shows the nearest places to view it. Another new premium feature hooks into Apple Health to allow you to record mindfulness minutes while you gaze at the sky.

Night Sky is a brilliant app for absolutely anyone interested in astronomy. Its AR features are particularly good, allowing you to walk through portals onto planets and pull celestial bodies out of the sky to look around them. Great fun! We also like the light pollution tool that finds the closest 'dark' places to your location.

Overall version 7 is a terrific upgrade, but there are a couple of issues. We found that it crashed on our iPhone XR running iOS 13 a few times while we tested it. And, despite a lengthy tutorial, there's little help available when it comes to using and getting the most from specific features. We also didn't like being pestered to upgrade to an annual plan seconds after taking out a monthly subscription. **Kenny Hemphill**

"AR features allow you to walk through portals onto planets and pull celestial bodies out of the sky."



GhostBSD 20.1

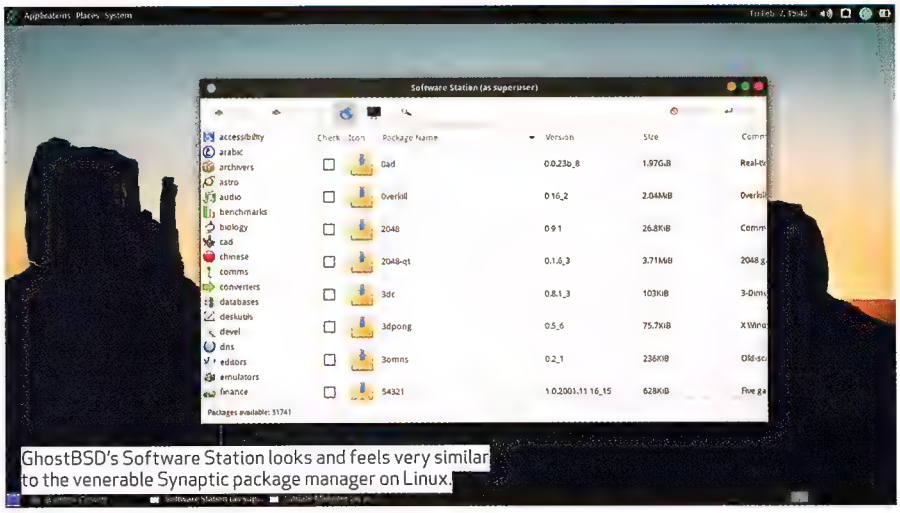
There were many people who said BSD didn't have a ghost of a chance on the desktop. Mayank Sharma was one of them.

FREE | WWW.GHOSTBSD.ORG

SDs have all the hallmarks of server operating systems, but you wouldn't think of running them on the desktop. GhostBSD is one of a small number of projects that's working to change that perception. Unlike its peers, though, which just slap a desktop environment on top of a BSD base, GhostBSD puts in the effort to create a very approachable and functional desktop. For instance, GhostBSD boots straight into a live graphical desktop environment, which makes it accessible to users irrespective of their familiarity with BSDs. The OS uses the lightweight MATE desktop environment, and you wouldn't even realise you're running a BSD-based OS.

Behind the scenes though, it is still BSD. Until a couple of years back, GhostBSD was running on top of a pure FreeBSD base. It then shifted to TrueOS, which brought along several enhancements, in particular the OpenRC init system. GhostBSD is still based on TrueOS, but the project has dropped the CURRENT branch and instead moved to the STABLE branch for ABI stability, with the integration of the latest system update developed by TrueOS. With the 20.01 release it has re-based the OS to FreeBSD 12.1-STABLE.

GhostBSD uses its own home-brewed GBI installer to anchor the OS to the disk. While it isn't particularly cumbersome to operate, when navigating it you'll get the first signs you're running a non-Linux OS. The installer recommends first-time users stick to the option of allowing the OS to take over the entire disk. There is an option for custom partitioning as well that has been improved in this release, particularly for UEFI-enabled machines. However, you must be well-versed with the UFS file system to venture anywhere near it. So the inclusion of a custom partitioner for an alien filesystem essentially forces you to stick to the recommended option. All things considered, this is a serious limitation, since many users wouldn't have a spare machine to dedicate to GhostBSD.



GhostBSD's Software Station looks and feels very similar to the venerable Synaptic package manager on Linux.

> "Has all the essential elements to succeed as a desktop OS."

NO GHOSTS IN THE MACHINE

The installer also gives you the option to install the GhostBSD Boot Loader. You should install this if you want the OS to take over the entire disk. The GhostBSD bootloader will also be able to boot Windows. However, if you are dual-booting GhostBSD with a Linux distro, it's best to skip installing the GhostBSD bootloader and instead use your Linux distro's existing one. In such a case, just install GhostBSD, boot into the installed Linux distro and run the update-grub command to add GhostBSD to the boot menu.

Outside of the installer, though, there is hardly anything that will appear alien to a Linux desktop user. In addition to MATE, the familiarity is further enhanced by the fact the application menu houses all the usual open source apps that you find on just about every desktop Linux distro.

Another big positive for the project is its range of custom apps for essential administration tasks. For instance, fleshing out the installation is a no-brainer thanks to the graphical Software Station app, which is a frontend to FreeBSD's pkgng package manager. Similarly, you can use Update Station to track, fetch and install any updates to both the system and the installed apps. Another interesting custom app is Station Tweak, a fork of the MATE Tweak app, and will help you to customise the desktop by tweaking various elements of the UI.

GhostBSD is essentially a one-man project but has all the essential elements to succeed as a desktop OS. Its engineering efforts are backed up by a decent documentation and support channel that's good enough to acclimatise new users. ■

Microsoft Office

How to excel.

FREE TO DOWNLOAD | OFFICE.COM

The newly consolidated Microsoft Office app now collects everything into one place, so you can organise your Word, Excel, and PowerPoint files all in one place, as long as they're uploaded to the cloud. This means that you no longer need to have three separate apps on your phone or tablet, which makes things a bit tidier. You can work on your files or make new ones from the app, too, and it works much better than the atrocious Google Docs app (although unfortunately you can't share files so easily as you can through there). Is the Microsoft Office app a perfect substitute for using these applications on a home computer or laptop? Not at all – trying to build a PowerPoint on a phone is a nightmare. Is it a great way to keep track of your files and make minor changes on the go? Absolutely, and having all your files in one app is handy. Microsoft Office might not be the most exciting app on your phone, but it'll make working away from your desktop a lot easier.

James O'Connor

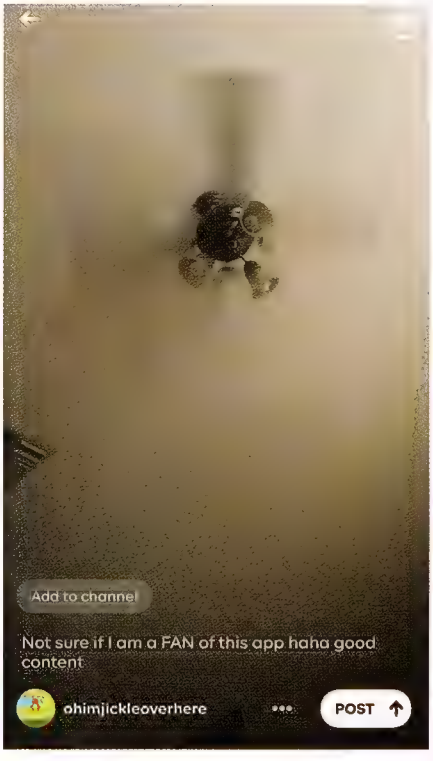
byte

Chomp chomp.

FREE | BYTE.CO

Byte is, apparently, the new Vine. I thought that Tik Tok was the new Vine? As far as I can tell, two things are true here – I am very old, and these are all the same damn app, with the main difference being that byte's looped videos run just 6.5 seconds to Tik Tok's 15. This means that the videos on Tik Tok are given a bit more breathing room, and, in theory, folks making things on byte need to be economic, getting to the point of their video as fast as possible. There's a very specific cadence to the videos that byte's users are making; they've been trained by society in the art of being short and sharp, and bless 'em, scrolling through byte is fairly delightful as a result. The app separates videos into broad categories, and it's a great way to pass 5-10 lazy minutes on an otherwise quiet afternoon. Will we start to see a new wave of byte comedians emerge like we did with Vine? Time will tell, but for now it's a lot of fun.

James O'Connor

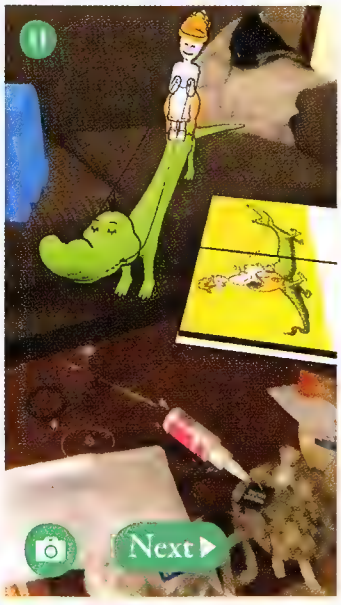


Dr. Seuss' ABC – AR Version!

App for kids, bids mids lids.

$5.99 | WWW.SEUSSVILLE.COM/

Dr. Seuss comes alive in this AR app, but there's no rambunctious cat monsters or haughty tree spirits for your children to deal with here. This is aiming at the good doctor's very youngest fans – it's a simple app designed to help them learn how to spell out the alphabet. Your child (or you, if you're an adult who reviews apps for a magazine) has to trace out each letter with a finger, in both capital and lower-case forms, before being rewarded with a small AR scene of Seussian creations cavorting. This is a Seuss product, of course, so expect plenty of alliteration – spell out B and you'll get "barber baby bubbles and a bumblebee." It's neat, but don't expect your kid to be super engaged, or to, necessarily, like it more than a regular book (it's certainly more complicated to read, and it's not really teaching them how to write with a pencil). There's a playground mode too, where you can stamp AR critters all over the room, which is neat fun. **James O'Connor**



THE SENSIBLE TECH & TOOLS GUIDE TO WORKING FROM HOME

Long-term home worker Chris Szewczyk has good advice for the tech you'll need to do it right.

We're living in a world in upheaval, on a level not seen since World War II. The COVID-19 coronavirus pandemic is dominating world headlines with health systems facing unprecedented strain, the global economy taking a pummelling and financial markets in meltdown. Whether it's work, recreation, social gatherings or travelling, it's all in a state of flux as the world adapts in an effort to try and halt the spread.

One of the ways to minimise human interactions, and thus risk, is by having people work from home where feasible, whether by individual choice, company policy, or – in the worst case scenario – you are forced to self-isolate with symptoms.

It's a dramatic change of lifestyle, though it can be perfectly feasible if you're able to manage your time effectively and you have the right tools at hand to help you do it with minimal stress.

If you are going to work from home, you'll need to be set up for the task. We're here to give you the right advice, to help you with the tools you need to stay in touch with your co-workers and be productive.

In these uncertain times, it's more important than ever to keep your income flowing so you can pay your bills and support your family!

A DEDICATED WORK SPACE

Working from home can be a shock for some. The sudden clash of home and work life can lead to a time management and productivity hit. It's important that you have a dedicated work space, and that your family or house mates understand that you are mostly unavailable during working hours, at least as much as is possible. Try to keep the area free of unnecessary distractions. Work time is exactly that. Within reason, it's not the time to play with your dog or cat or for that matter gaming with your friends or having distracting conversations. Children should also be aware of mum and dad's work time and try to amuse themselves.

You may want to consider the purchase of a quality office chair that's ergonomically sound. Your back will thank you for it. A spare dining room chair is a poor substitute. Perhaps your workplace might let you take your office chair home with you and bring it back when work resumes? Obviously you'll need a desk area too.

Most importantly the area needs networking coverage. We'll get to that in a later section but if your area has no Wi-Fi or the router is on the other side of the house, you'll need to upgrade your networking or try to choose another work area.

While relatively expensive compared to a basic office chair, the Aeron is legendary for its comfort and will save your back.

Working from home might be a shock for some. Try to create a routine like you would have at the office, and stick to your regular work schedule. Take your breaks but also don't be afraid to detune from work. Instead of going to a mess room like you might do at lunch time, head out into the garden, have lunch with your kids or even play a round of PUBG! Take the opportunity to recharge.

A LAPTOP OR PC IS CENTRAL TO YOUR HOME OFFICE

It goes without saying that you'll need a PC or a laptop to function properly. But if you've got an old clunker, it can be a severe bottleneck to your productivity. Things like critical errors, slowdowns, network timeouts or BSODs are not what you want when you need to stay connected with your colleagues.

You may wish to consider purchasing a new laptop or PC. If you're in a position to ask, check with management or your IT department to see if they can advise. It's possible there's a system or laptop you can use. If you're fortunate, your workplace might consider purchasing a unit for you. Alternatively, most work-related purchases can be eligible for tax deductions for some or all of the cost. That goes for everything mentioned in this article (disclaimer: this is not taxation advice. Check with your accountant for advice on claiming a work related purchase)

You won't need a super powerful machine for

A dual- or even triple-screen arrangement seriously enables productivity and is a delight to work with.

"With exceptions, it's advisable to steer clear of gaming type laptops with high-end GPUs, particularly if you're using general office type apps."

NUC PCs offer perfectly adequate power for most productivity tasks, and can be extremely cheap.

most kinds of tasks. In some cases, even a fairly basic NUC will do the job, though you'll want it to include an SSD. If you need a monitor, you could even consider going with two or three screens. Workers used to using multiple screens at work in particular will appreciate the ease of multi-tasking, where you might have a chat window open, email and office apps and then your main workflow application all at the same time. If you do go the multi-monitor route, you may want to consider a multi-monitor arm. Who knows, after the pandemic is over you could repurpose multiple screens towards a lovely gaming rig. There has to be a silver lining to all this, right?

With the amount of video and voice meeting we are now doing, a decent webcam and mic is a must.

With exceptions, it's advisable to steer clear of gaming type laptops with high-end GPUs, particularly if you're using general office type apps. They tend to have powerful CPUs and plenty of memory, but have low battery life and can be quite heavy, which is something to note if you plan on moving it between home and the office. Of course if you're a creative professional, you'll need something with a bit more grunt, whether it's a high core-count CPU, a colour-accurate screen or even a professional graphics card in a dedicated workstation. If creative work is what you do, you'll need more memory and storage than a typical work PC would have.

HARDWARE TO STAY IN TOUCH WITH YOUR COLLEAGUES

Of course, not everyone will need a new system, particularly if you're looking at going back to your workplace in weeks instead of months. In many cases a few simple upgrades will be all that you need to stay instantly accessible to your colleagues.

Most laptops come equipped with a webcam and this can be utilised by whatever software you have; desktop PCs don't usually come with webcams, so you'll need to consider a stand-alone one. It may or may not have a microphone built-in, so you may need a headset too. Pretty much any headset will do. Perhaps you have a gaming headset you can utilise. Alternatively a set of regular audio headphones will do the job and you could consider the purchase of a microphone if it's not built in to what you have.

Other options include a VoIP phone. Though its use at home is not as easy as dialling extension 555 like you might at the office, it can still be utilised by various applications.

You may need a printer or a scanner, with the latter important if you need to send signed documents. Most all-in-ones are quite capable these days, but be aware that many printers now ship with next to no ink or toner included, so it's advised that you buy a spare cartridge so you don't come to sudden halt when you least want it.

If you've got a laptop you move around frequently, consider buying a dock. They generally connect via USB and add a lot of connectivity options that a standalone laptop, particularly an ultra-thin, may not have. Look for

one that suits your needs; for example if you plan to run multiple screens, need extra Type-A USB ports or require 3.5mm headphone and microphone ports for some headsets.

NETWORKING

Staying in touch with your workplace becomes a whole lot more difficult if you have poor networking at home. If you're fortunate to have a decent NBN connection then you're halfway there, but your home networking can be a major bottleneck depending on the layout of your house. You may need to upgrade your router or network switch. If you live in a large house, you may need to consider a mesh network or range extender so that you have a good quality connection everywhere. Perhaps something as simple as a long network cable will do the trick.

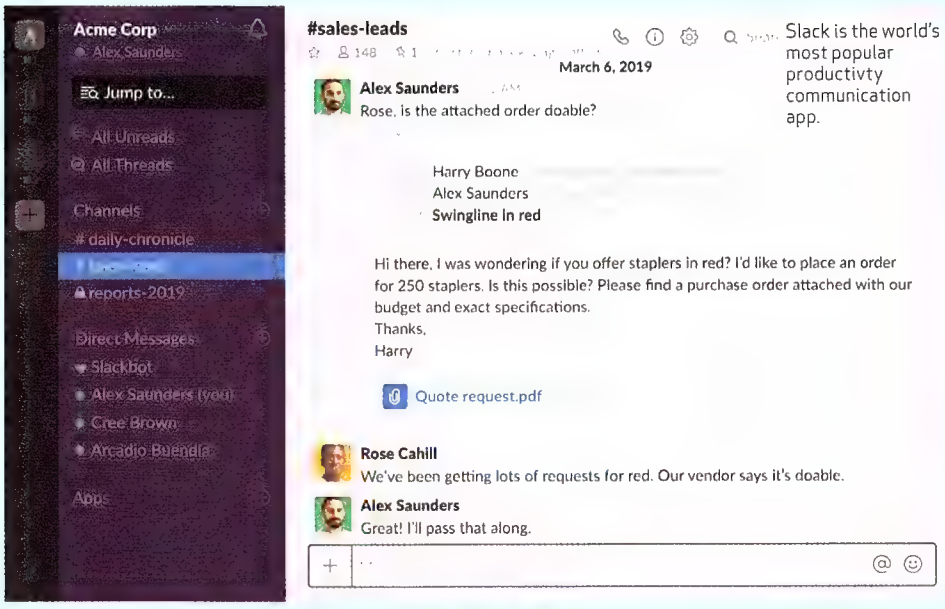
A decent router will also have some traffic prioritisation capabilities. If your family members are all data-hungry with constant Youtube viewing or Netflix streaming, then you may want to consider some form of traffic management, allowing things like a video call to go uninterrupted at the expense of little Jimmy's latest torrent download.

YOU'LL NEED THE RIGHT SOFTWARE

Having the right software is critical to any workplace and doubly so if you're working from home. In many cases it may not be feasible to come up with the money for some of the applications you need. Some proprietary software can run into the thousands of dollars. In this case you'll need to liaise with your workplace to determine the best course of action for your specific needs.

If you have something like a work intranet or email server, you'll need to make sure you have the right permissions to access them remotely. It can be more complicated than just having a simple password. You'll need to arrange this through your workplace.

There are plenty of ways to remain productive without spending a cent though. Google Apps is a terrific way to get everyday tasks done. Word processing, spreadsheets and slideshows can all be created and shared with anyone. Collaboration is also possible so real time changes can be seen by your colleagues or team members.



Slack is the world's most popular productivty communication app.

With all the talk about social distancing and proper hand cleaning, don't forget that things like your keyboard and mouse can be a hive of possible contamination. Consider buying some isopropyl wipes and use them to keep your keyboard and mouse clean.

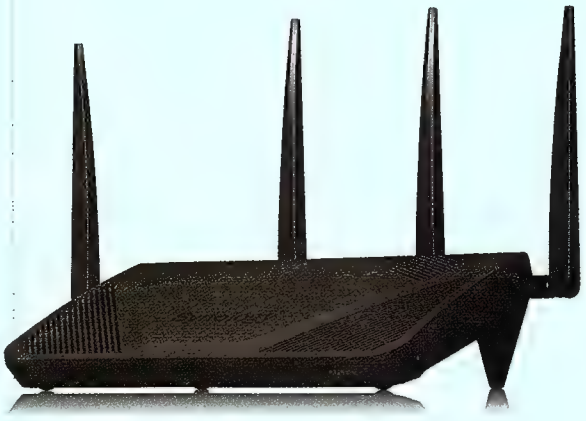
Instant real time communication is vital for any workplace. While good old email is still perfectly viable, when working from home it's difficult to replicate the environment of frequent in person conversations you have all the time at the office. You'll need software to stay in touch. Simple instant messaging programs like Line, Whatsapp, or Skype have evolved to allow text, audio and video calls either on a PC, laptop or phone and this kind of app may be sufficient for a worker who simply needs to keep in touch.

You might want to consider something like Google Hangouts. It's a fairly simple communication tool that has the advantage of being integrated with the rest of the Google ecosystem. It allows you to do things like group video calls, chat, and screen sharing.

Perhaps you already have a collaborative solution at work, where team members can see what other team members are doing. If so, adding that particular app to your home system could be very simple.

One of the more popular communication apps is Slack. It allows teams to text and call, share and collaborate but it also has support for commonly used 3rd party applications such as Google Drive, Microsoft Office, Dropbox and Github amongst many others. It's a powerful app but it could be overkill if you're planning on going back to work in short order. The free version of Slack is recommended, it can do a lot and handle large groups.

Is it time for a router upgrade?



ABOVE ALL STAY SAFE!

The whole purpose of being asked to work from home is to prevent the spread of the COVID-19 virus between colleagues, the wider community and your family. The most important thing is to be smart and stay safe. We all hope these disruptions are short term only. Perhaps there is a silver lining though; you may find working from home to be a productive, rewarding and less stressful experience, not to mention the bonus of the extra time you'll have in your day by skipping your commute. If you're set up with the right hardware, software and workspace, perhaps you'll really enjoy working from home, instead of it being something you're forced to do.

Working from home: tips to keep you sane and productive

Avram Piltch says don't work in your pyjamas.

There are four potential problems with working at home that you won't experience in the company office.

IN-HOME DISTRACTIONS

Whether it's your cat jumping on your lap, your toddler screaming for attention or your partner asking you to just take a minute to do the laundry, people and/or animals may be asking for your attention. The environment of your home could be a distraction too, as it's filled with items like your TV, your snack pantry and your video game console.

ON-COMPUTER DISTRACTIONS

Even when you're in the office, it's a challenge to avoid checking social media or reading the headlines on a news website. At home, with nobody looking over your shoulder, it's even more tempting.

ISOLATION

When you're at the office, you have coworkers to talk to throughout the day, but at home, you're staring at the wall. That gets kind of depressing.

LACK OF TOOLS

At work, you may have a have a fancy office chair, multiple monitors and a good keyboard and mouse. But perhaps at home, you don't have all of that.

TIPS FOR WORKING AT HOME

Here are some tips to help you deal with these problems and be your best.

1 INSTALL ANTI-DISTRACTION SOFTWARE

It's far too easy, even when you're at work, to check Twitter to see what latest outrage or horror is happening out in the world. Use browser extensions such as Stay Focused to restrict your access to social media, news and other time-sucking sites during the work day.

2 LAY DOWN THE LAW WITH FAMILY / ROOMMATES

You may have to practice some tough love, but tell them know that they cannot ask for your attention at all during the workday.

"Whether it's your cat jumping on your lap, your toddler screaming for attention or your partner asking you to just take a minute to do the laundry, people and / or animals may be asking for your attention."

3 FIND A DEDICATED SPACE FOR WORK
The ideal situation is to have a home office that's a separate room with a door that closes. However, even if you have a studio apartment, you can probably find a corner to designate as your workspace. Go into this space at work time and leave when work is done or for breaks. If it's an office, shut the door when you're in it and when you leave for the day.

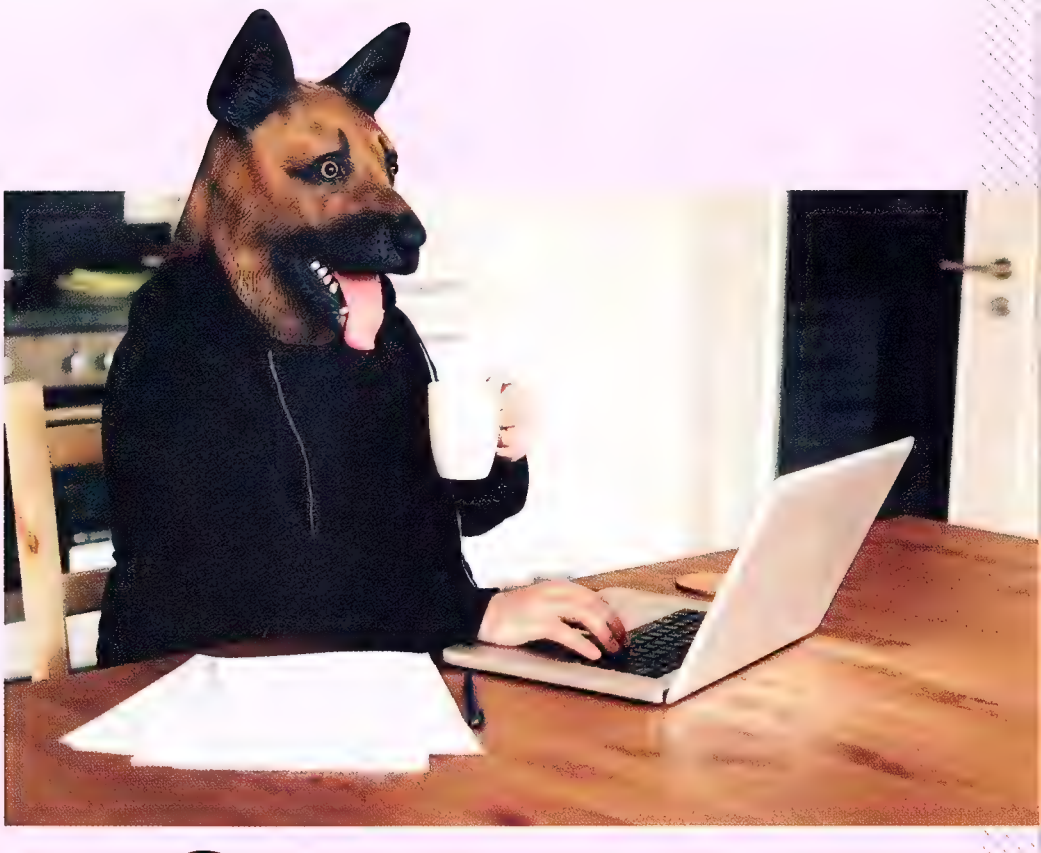
4 DRESS FOR WORK
Do not work in your pyjamas. To get in the mindset for productivity, take your shower, brush your teeth and put on work clothes just as you would when going into the office.

5 START THE DAY WITH WORK THAT REQUIRES LESS CREATIVE THINKING
At home or sometimes even in the office, it's hard to get "into the zone" when you first start working. For me, writing articles or doing long-form edits requires the most engagement, so I like to start with less creative work such as approving invoices or generating reports.

6 KEEP A SET SCHEDULE
To maintain work/life balance, log on at the time when you would have arrived at the office and log off at the time you would have left.

7 USE VIDEO CONFERENCING RATHER THAN PHONE CALLS FOR MEETINGS
It's important to see and be seen when you're not at work so keep your webcam on and ask that your colleagues do the same for meetings.

8 NOTIFY COWORKERS WHEN YOU LOG ON / OFF FOR A LONG TIME
If your team uses an instant messaging app such as Slack to communicate, people, including your boss, may expect an immediate response when they message you. If you're going to be at lunch for an hour or logging off for the day, it's good practice to post something in chat to let people know you won't be around. You don't have to tell everyone when you take a bathroom break or grab a soda from the fridge. It's also good practice to tell your team when you log on in the morning so they know you are available.



Staying sane

Kate Kozuch has four tips to make your days easier to manage during the coronavirus quarantine.

The coronavirus pandemic is pretty awful, but you already knew that. It has disrupted your life in one way or another, marginally or monumentally.

People everywhere have lost their jobs, shuttered their small businesses, been sent home from universities or have themselves been one of the people worldwide diagnosed with COVID-19. More fortunate folks are working from home, cancelling travel, distancing from friends and adjusting daily routines.

Wherever your life lands on the spectrum of the coronavirus' far-reaching effects, you've probably adopted a "when things get back to normal" attitude as you touch base with pals, or make plans for some undisclosed time in the future.

Normal is a complicated concept, though. There's a chance that what you considered normal a month ago won't be the same in a month or two. Normal evolves constantly, but rarely at the pace it is now.

I've spent the last week social distancing at home with my dad, who, as a retired first responder, can only compare the chaos society is experiencing to the potent impact of September 11th's terrorist attacks.

Life was not the same after 9/11. What was normal suddenly wasn't. It's a grim parallel to draw, but it's become apparent we're in the midst of a significant change that's making most lives more difficult than they were weeks ago.

Major change may induce anxiety, while challenging situations can cause significant

"There's a chance that what you considered normal a month ago won't be the same in a month or two. Normal evolves constantly, but rarely at the pace it is now."

"Think about the novelties or franchises that make you happy. I love Lego sets and Star Wars, so I bought a model version of Poe Dameron's X-Wing Fighter and spent an entire evening building it."

stress. My infamous "nothing bothers me" attitude is nowhere to be found, and I laid awake the first few nights of self-imposed isolation worrying about what the next day would bring without going to the office, socialising in person or making it to a workout class.

I'm aware that could come off inane, or even privileged in the scope of the undeniable devastation coronavirus has caused across the globe. But there are people who might be struggling to contribute optimism at a time we desperately need it because they're paralysed by uncertainties.

I tried injecting some normalcy into my life, and it's worked at least a little bit. I've made minor adjustments to my day, and am letting myself have fun while stuck home and not feel guilty about it.

Mood-boosters are different for everyone, but sometimes you need inspiration. Here are a few places I'm finding pockets of happiness inside this intimidating vortex COVID-19 has stuck us in together. And no, none of them involve spring cleaning.

SHARPENING KITCHEN SKILLS

I've always enjoyed cooking, but getting better at it requires time. Instead of whipping up the same few foods I'm comfortable making, I'm finally taking a look at the recipes I've torn out of magazines (some several years old). The result is a few hours of distraction in the kitchen and an interesting dinner every night.

MOVING AND GROOVING

As an active person taking social distancing seriously, I struggled to find ways to move in my small living space. I even took a hiatus from working out, which, as many can attest to, is hard to recover from. I made a playlist of my favourite dance songs and, with the help of my booming Sonos Move, impromptu dance breaks became mandatory. Fire up a good speaker, set intermittent times and boogie until you can't boogie no more. Physical activity stimulates the release of dopamine, norepinephrine and serotonin, which helps elevate your mood.

GAMING AND GEEKING

While I'm putting some of my monthly meals and movies budget in savings, I've also jumped on a few affordable entertainment purchases that I would normally skip on. I almost always buy games for my Switch Lite on sale, but figured now is a good time to get *Pokemon Sword* or *Pokemon Shield* (I went with the latter.)

With that, think about the novelties or franchises that make you happy. I love Lego sets and *Star Wars*, so I bought a model version of Poe Dameron's X-Wing Fighter and spent an entire evening building it. Look for jigsaw puzzles, art sets or other activity kits featuring the licenses you love.

DONATING WHEN POSSIBLE

A tangible way to help others experiencing hardship during the coronavirus outbreak is with dollars. If you're saving money you'd normally spend at bars and restaurants, consider donating to charity organisations.

Another outlet to put money toward right now is the small business sector. With countless salons and shops closed for social distancing, consider buying a gift card to a local store you frequent. Your patronage will help them now, and you'll be able to take advantage of the credit when things are, well, normal.

When normal returns and what it'll look like is a mystery. Until then, I'm going to keep doing my part to put forth positivity. I encourage you to, too. ■

09 THINGS YOU SHOULD DO WITH YOUR PC

Looking for fresh inspiration on how to use your PC? Nick Peers reveals some bold new ideas.

Variety is the spice of life, and that's true for your PC too. If you're stuck in a rut with Windows, increasingly bored with the endless routine of system maintenance, word processing and web browsing, we've got just the tonic to inject some spice back into your computing. Over the next eight pages we're going to reveal nine things you should look to do over the coming 12 months.

We'll open with a quick reminder to ensure that Windows is in the peak of health, and then plunge into the fun stuff. We'll set you on the path to researching your family history, reveal how to make better use of those hundreds of digital photos cluttering up your hard drive, plus give your brain a good workout with the right games. We'll also reveal the free apps available to help you learn a musical instrument – or simply pick up where you left off some years ago.

There's space to put your personal finances in order plus organise favourite collections so you can keep track of what you have (and who's borrowed them). We'll reveal the perfect tools to help you become a storyteller and full-blown published author before looking at the best streaming services out there. Frustrated by what's on offer? Then why not complete your computing reawakening by building your own, on-demand and always-available streaming service instead? Come on, let's get refreshed.

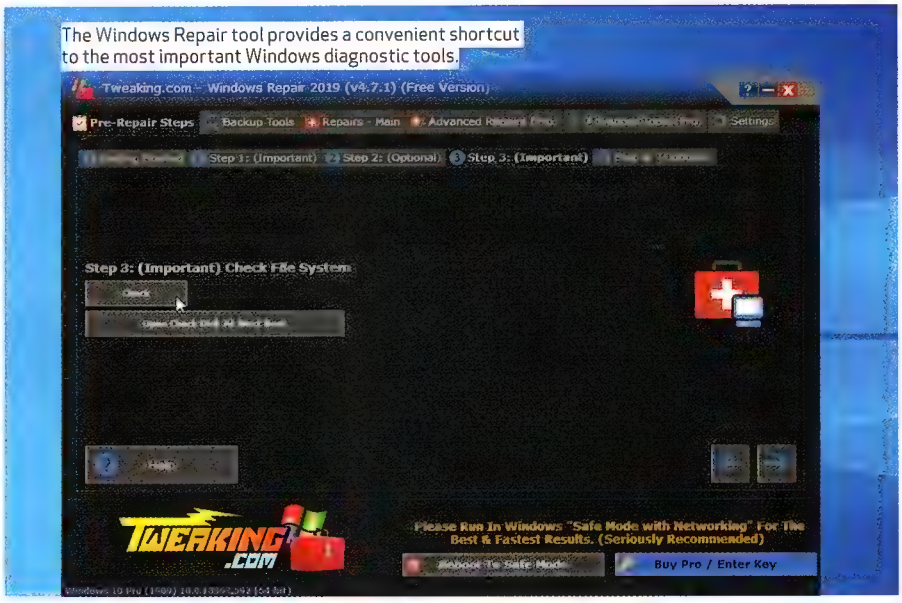
Put your PC in good order

Make sure your PC is fighting fit and running smoothly before diving into new pursuits.

Before embarking on your quest to explore new fun and productive ways to use your PC, start by giving your PC the once-over. Begin by checking your backups are working as they should – the box below reveals all you need to know. Once that's done, run a few system checks to verify there are no underlying problems that might catch you out later. The quickest and easiest way to access these is Tweaking.com's Windows Repair Tool – go to **www.tweaking.com** to download, install and run the latest version.

Start by focusing on the 'Pre-Repair Steps' tab where you can run through a series of standard Windows checks: a pre-scan for missing files and links, a disk check and finally a system file check. Windows Repair steps you through all of these – reboots may be required, in which case simply reopen the program when done and carry on. The checks have repair capabilities built-in, but if you find you're suffering from a specific problem check out the 'Repairs – Main' tab to perform additional fixes.

You can also instruct Windows to run its own troubleshooters: open Settings and navigate to 'Update & Security > Troubleshooting' where Windows will provide a list of recommended options based on your PC's recent behaviour. You can also scroll down the page to reveal a list of all available troubleshooters, allowing you to run them even if Windows doesn't detect a problem.


The Windows Repair tool provides a convenient shortcut to the most important Windows diagnostic tools.
Tweaking.com - Windows Repair 2019 (v4.7.1) (Free Version)
Pre-Repair Steps
Backup Tools
Repairs - Main
Settings
Step 1: (Important)
Step 2: (Optional)
Step 3: (Important)
Step 3: (Important) Check File System
Check
Please Run In Windows "Safe Mode with Networking" For The Best & Fastest Results. (Seriously Recommended)
Buy Pro / Enter Key

CONSOLIDATE DISK SPACE

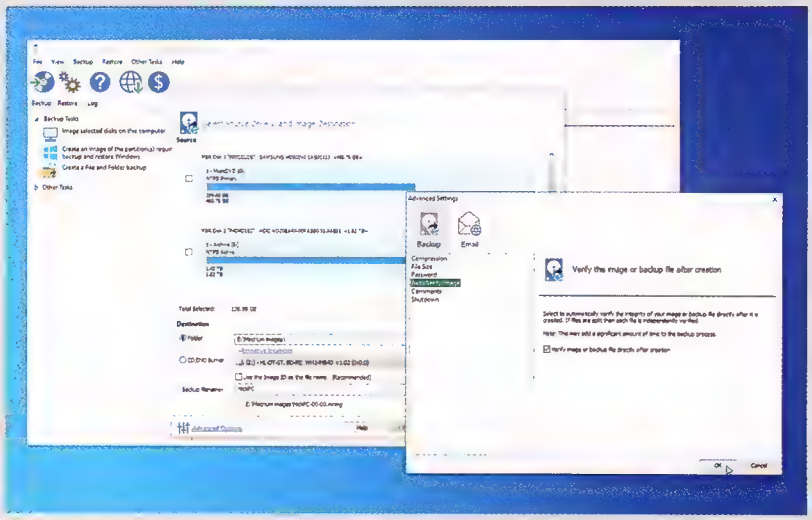
With Windows checked, your next step should be to clear out redundant files to free up disk space. There's no need to install any third-party apps – navigate to 'Settings > System > Storage' where you'll find an option to switch on Storage Sense, Windows' own clean-up tool to keep your hard drives free from junk. It provides a handy overview of what types of files are taking up most space, plus by clicking on the relevant section (such as Apps & features, Temporary files or Other) will whisk you to the right part of Settings to review its findings in more detail and free up more space manually if required.

You can also configure Storage Sense to run automatically – either on a daily, weekly or monthly schedule, or whenever your drive runs low on free space. Choosing the latter option should ensure you don't run it unnecessarily.

Review your backup regimen

It's easy to take the 'set it and forget it' mantra of backup literally and assume everything is proceeding smoothly in the background. As part of your maintenance regimen, take the time to open your backup tool(s) and check everything is running as it should. Look for any alerts that indicate one or more backups have failed; also verify your backup jobs. Are they running often enough? Is there an option to automatically verify your backup (to ensure it'll work when you need it to) – if not, can you at least verify the backup manually? Now is a good time to consider alternating your backup between two separate locations – say a USB drive and a network drive – to add an extra layer of redundancy in case one backup device fails.

No backup at all? Navigate to 'Settings > Update & Security > Backup' to configure File History for backing up important documents, photos and other personal files, and install Macrium Reflect Free (**www.macrium.com/reflectfree.aspx**) to take a failsafe image of your entire hard drive – including Windows installation.



Research your family history

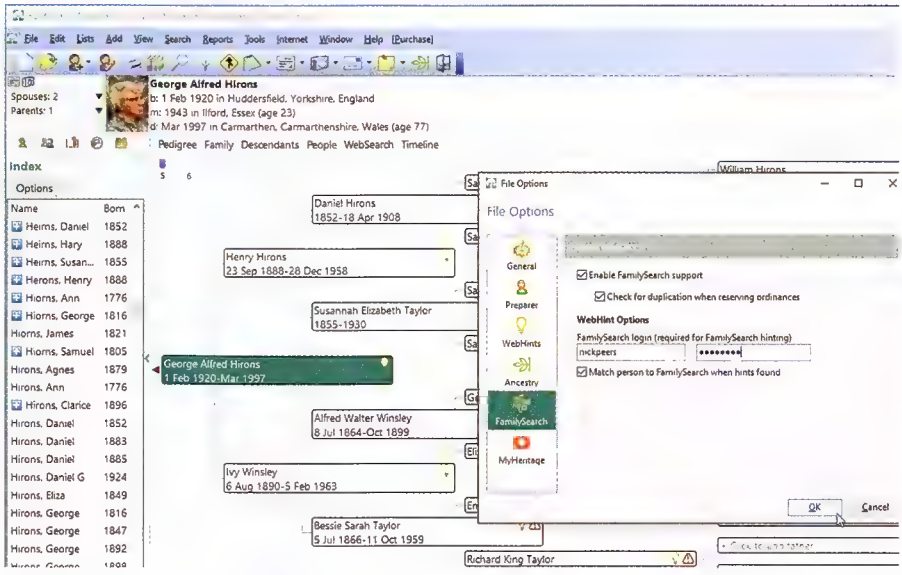
Reconnect with your past in this exciting and revealing pursuit that was tailor-made for your PC.

There's something to be said for connecting with your family history – the thrill of rediscovering your ancestors cannot be matched as you piece together their lives through documents, digging out old family photos and even making contact with distant cousins to share and uncover more insights.

These days, most of that research can be done online, and if you know where to look you can make major inroads into developing and expanding your tree without spending hundreds of pounds on expensive subscriptions. The place to start is **www.familysearch.org** – this doesn't simply provide a giant, shared tree of human existence, but it's also a repository of information, including documents, photos and useful resources for further research via its wiki (**www.familysearch.org/wiki/**).

You'll need somewhere to store all this information, and there are plenty of programs out there to lend a helping hand. If you do choose a paid-for subscription site like Ancestry, then it pays to choose a program designed to make it easy to extract information and digitised images of documents directly from the site into your research file.

One free program that supports FamilySearch is RootsMagic Essentials, which you can download and install for free from **http://rootsmagic.com/essentials/** – it's a cut-down version of the main program (US$29.95 from **www.rootsmagic.com**), but all FamilySearch functionality is completely free.



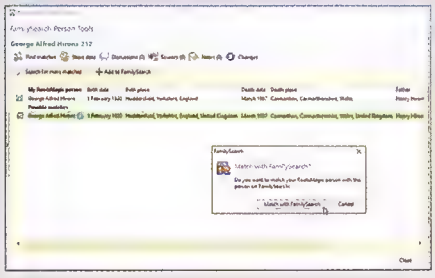
Link RootsMagic to FamilySearch to find – and download – information about family members.

LINK TO FAMILYSEARCH

The program is relatively simple to use and will be familiar to anyone who's previously dabbled in genealogy – when creating a new document, leave 'Begin typing my information' selected before clicking OK. A blank tree will appear – click the button to add a person and enter your own information as the home person. From here you can add additional facts, attach photos and other information as we outlined in detail in our September 2019 issue.

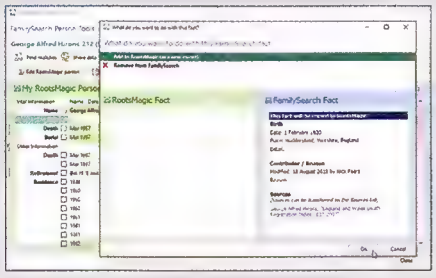
When it comes to linking in information from FamilySearch, select 'Tools > File Options'. Select FamilySearch, tick 'Enable FamilySearch support' and 'Match person to FamilySearch when hints found' and enter your login details. Now follow the step-by-step guide to link individuals to FamilySearch and download information from them into your tree in just a few clicks.

Find family records online



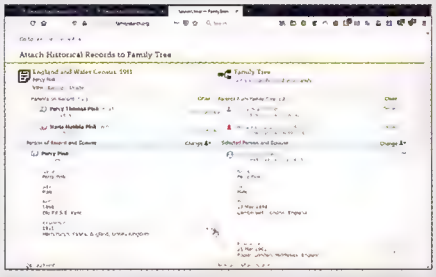
1 FIND AND LINK

After linking FamilySearch to RootsMagic, look for a FamilySearch icon next to people in your tree. Click it and – if asked – sign into your FamilySearch account again. If you spot an ancestor in the list of possible matches, tick the box and click 'Match with FamilySearch'.



2 VIEW ONLINE DATA

Switch to the 'Share data' tab to compare your entry (left) with the entry on FamilySearch (right). To add a fact from FamilySearch to your research, click its tick box in the right-hand pane. Review the fact and if you're happy with it, click OK to merge it.



3 FIND MORE FACTS

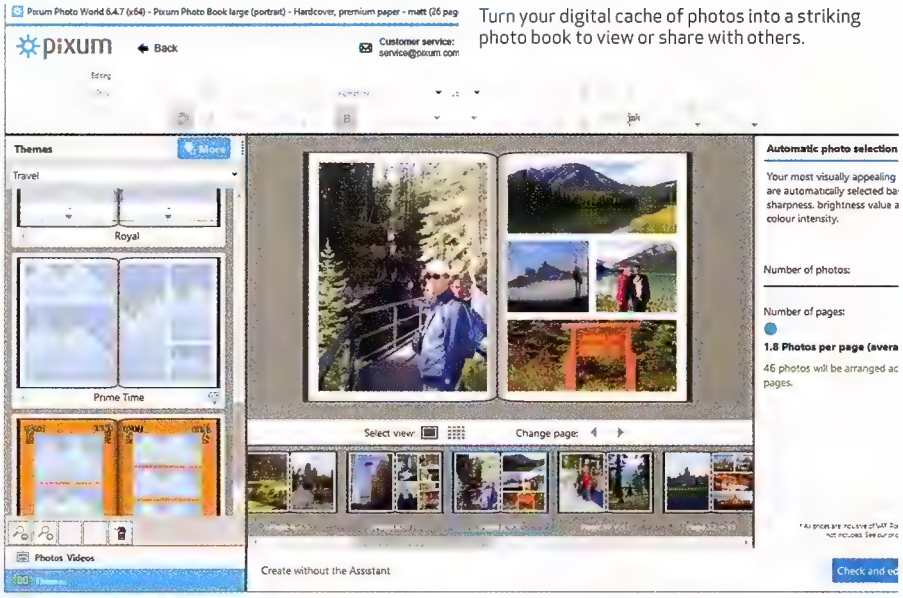
Log into your Family Search account online (**www.familysearch.org**) to find your ancestor on there. You can then search for information to add to the online record – once it's been added here, the new information will appear in RootsMagic to merge into your file.

Do more with your photos

Show off the best of your photos with a digital slideshow or beautifully printed photo album.

You've finally got your photos in some kind of order. But what's the point of having them buried away in folders if you've no means of showing the best of them off? You could invest in a digital photo frame for your front room, run a slideshow as your desktop backdrop in Windows (head over to 'Settings > Personalisation > Background' to set it up) or create a photos slideshow running as a screen saver (type 'screen saver' into the Search box to find the tool, then choose Photos from the 'Screen saver' drop-down menu).

Remember when older family members set up slideshow presentations of their latest holiday? Recreate the effect via a video-based slideshow, with added music, effects and captions to help describe what's going on and keep your audience interested. Our favourite tool by far for this job is Microsoft Sway – get it for free through the Microsoft Store. Your presentations are stored online but can be kept private or shared as widely as you'd like. The step-by-step guide reveals the basic steps to getting it up and running.



Turn your digital cache of photos into a striking photo book to view or share with others.

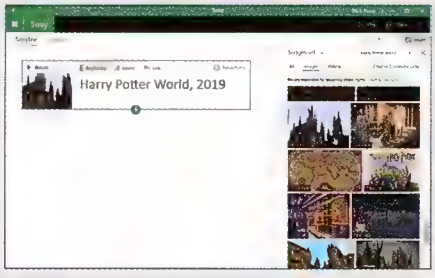
PRINT A PHOTO ALBUM

Sometimes there's no substitute for old-school prints and photo albums. These days, of course, you don't just buy photo prints then manually stick them into an album – everything is done digitally before being paid for, printed and dispatched. Many services like Photobox (**www.photobox.com.au**) operate exclusively through your web browser, but Pixum (**www.pixum.co.uk/photo-book/software**) allows you to download and install free software for you to create your perfect photobook in.

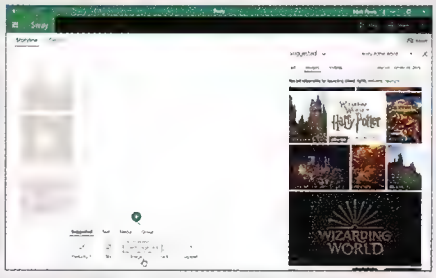
Once installed, launch the program and select the photo book option. Choose your book type followed by paper quality and then choose 'start with assistant'. Select your photos folder (you can also link Google and Facebook accounts if you wish for photos stored online). Now give your book a title, drag the photos (or a folder containing your photos) on to the main window, pick a theme and let the program do the rest.

From here you can manually tweak your photobook – add new photos, change page layouts, insert text and so on – before previewing and ordering your final copy.

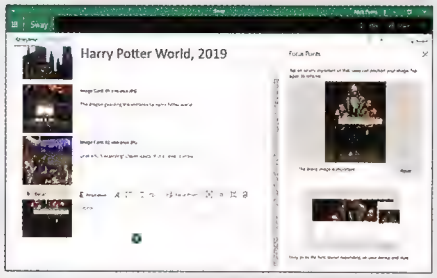
Create a digital photo slideshow



1 FIRST STEPS
Open Sway and click 'Create New'. Give your sway a suitable title, then click the Background link to the left to give your title page a suitable backdrop. You can upload a photo or use the online Bing search tool to locate an image you can use.



2 ADD PHOTOS
Click the '+' symbol beneath the title to add a new element: text (heading or plain text), media (images, video, audio clips and so on) and group (includes interactive clickable elements like a stack of photos). Drag images into your slideshow and add a caption.



3 MORE EFFECTS
You'll see options to create focal points – useful for focusing on specific parts of a photo, plus creating bulleted and numbered lists and all kinds of useful elements. Experiment and click the Play button regularly to see how your presentation is shaping up.

Exercise your brain

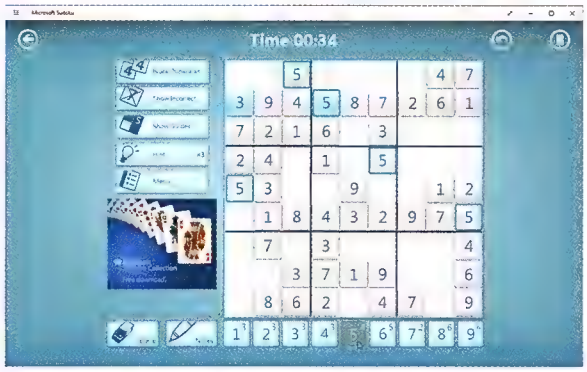
Get rid of the mind fog by giving your mind a regular workout with the help of these free games.

As we get older, it's important to stay active both mentally and physically. Exercising your brain has all kinds of benefits, but it pays to vary the types of exercise you do to keep things stimulated and open new neural pathways. Your PC can play a huge role in this – all you need to do is target the right kind of games and puzzles.

First, brush up on your word skills. Fan of crosswords? If you're happy to do so online, head to **www.boatloadpuzzles.com/playcrossword** where you'll find over 40,000 simple and cryptic puzzles available to solve in your web browser.

Perhaps you prefer word searches, in which case LR Studios' Word Search – Puzzles app is free on the Microsoft Store and offers unlimited puzzles. Next, give your maths skills a boost with Microsoft Sudoku, one of the few MS games to be completely free through the Microsoft Store, no strings attached. How about improving your language skills? Duolingo (**www.duolingo.com**) will teach you just about any foreign language and will help you to stay on top of your learning to ensure the vocabulary sinks into your memory.

BigJig (**www.lenagames.com/bigjig.htm**) will keep you occupied for hours with a wide range of jigsaw puzzles and no intrusive ads (a paid-for version allows you to generate puzzles from your own images once you've completed those offered within the program), while Brain Workshop (**http://brainworkshop.sourceforge.net/**) claims to boost cognitive function using the controversial N-Back mental exercise.



Microsoft Sudoku is a great way to clear the mental cobwebs and boost your learning power.

Finally, if you want to really give your brain a workout, visit Braingle (**www.braingle.com**) where you can select Mentalrobics to exercise your brain on a daily basis with a range of puzzles.

Catalogue your collections

Stay on top of your various libraries by recording them all using the brilliant Data Crow.

Data Crow (**www.datacrow.net**) makes it possible to create and maintain a catalogue of important items. Built-in modules cover books, contacts, audio CDs, movies (including TV), but you can build your own custom modules too.

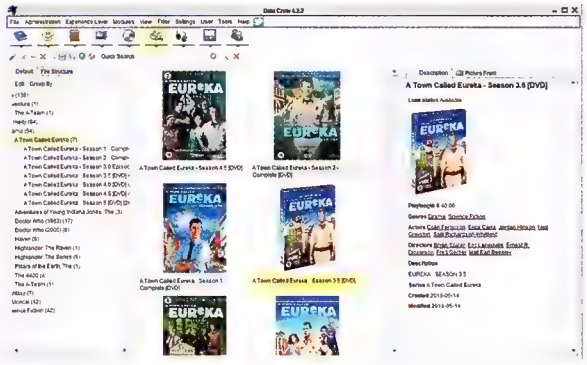
Once installed, select your collection type using the icons beneath the menu bar. From here choose 'File › Item Wizard' to enter the first item in your collection. You'll see that Data Crow links into several online databases – sadly, at time of writing, both IMDB and Amazon don't work, but thankfully other online databases offered by the program do.

Select your database, type in your title and with a bit of luck you'll find the exact item you own (multiple editions may exist, forcing you to review each one manually). You can then add this – complete with thumbnail image of the cover – without having to enter any additional information. All information is editable, so once entered, simply double-click an item to view and – if necessary – make changes or add additional elements such as photos.

YOUR COLLECTION

As your collection grows, Data Crow allows you to organise your collection into groups, which you define by selecting which fields to use. You can also apply filters and perform a quick keyword search of your collection to help find what you're looking for.

Many people like to lend items from their collection to others, and Data Crow provides a Loan Administration tab to allow you to manage this process by recording when an item was lent out and to whom. You'll never need to wonder what happened to that book or CD you may or may not have lent out (if only you could remember) again.


Another benefit of Data Crow is that it'll stop you buying duplicates of items you already own.

Take control of your finances

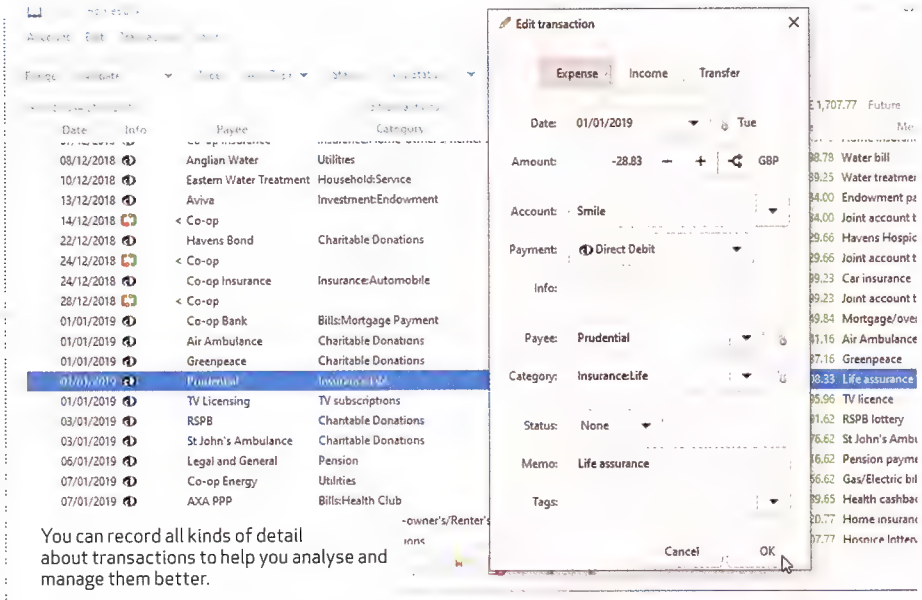
Manage your money with the help of your PC and a fabulous free personal finance tool.

So you constantly struggle to stay on top of your finances? Can't ever seem to work out exactly where your money goes or how much is currently in your bank accounts? What you need is a personal finance tool – and if you've been relying on Quicken or Money for the task, then it's high time you switched to something more modern (and guaranteed to remain compatible with Windows 10).

There are two basic options for you going forward. If you're happy to restrict your management to desktop and laptop computers, then HomeBank (**http://homebank.free.fr/en/index.php**) is the perfect choice. You can import data from Quicken or Money, then use it to record, track and analyse your financial ins and outs, giving you everything you need to get on top of your money and stay in control of your spending.

HomeBank supports multiple accounts within a single file, allowing you to separate your current account from your credit card and savings. Once set up, click the Add button to enter your first transaction – it's all pretty self-explanatory except make sure any payments out are recorded as negative values under Amount, and deposits into your account as positive ones.

Make good use of the Category field – this will enable you to track your spending to see where your money's going – a handy pie chart in the main screen provides a breakdown.



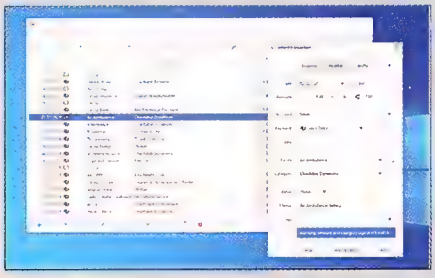
You can record all kinds of detail about transactions to help you analyse and manage them better.

As you build up incomings and outgoings you'll be able to make use of auto-fill to speed up data entry, but check the step-by-step guide below for a handy way to have all your regular incomings and outgoings entered automatically on the date they are due.

A CROSS-PLATFORM SOLUTION

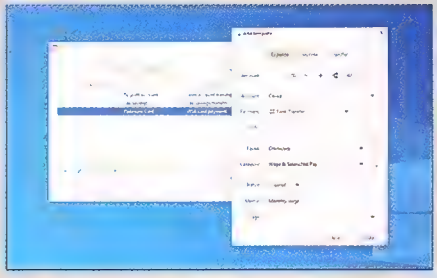
The biggest drawback of HomeBank is the fact you need to be at your computer to check and update your current financial state. If you're willing to pay for the privilege, however, you'll find plenty of tools that work across desktop, laptop and mobile, keeping everything in sync and allowing you to quickly record spending. We've been using Moneywiz (**http://homebank.free.fr/en/index.php**).

Set up recurring transactions



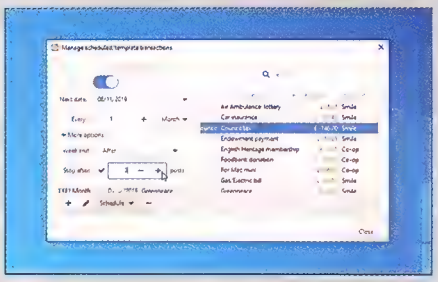
1 DUPLICATE

One way to speed up data entry in HomeBank is to take an existing transaction and duplicate it: select the previous transaction and click the Inherit button. A new identical transaction with today's date will be created – make any required changes and click Add.



2 CREATE TEMPLATES

Templates let you create new transactions with your choice of pre-filled attributes. Set up one from the main screen: choose 'Manage > Scheduled/Template'' Make sure Template is selected and click the '+' button. Fill in the details of your transaction and click Add.



3 REGULAR PAYMENTS

Direct debits, standing orders and other regular payments work in the same way. Select Scheduled and click '+'. Fill in the basic details of your transaction and click Add, then click the Schedule button to set up a recurring transaction using frequency, end date and so on.

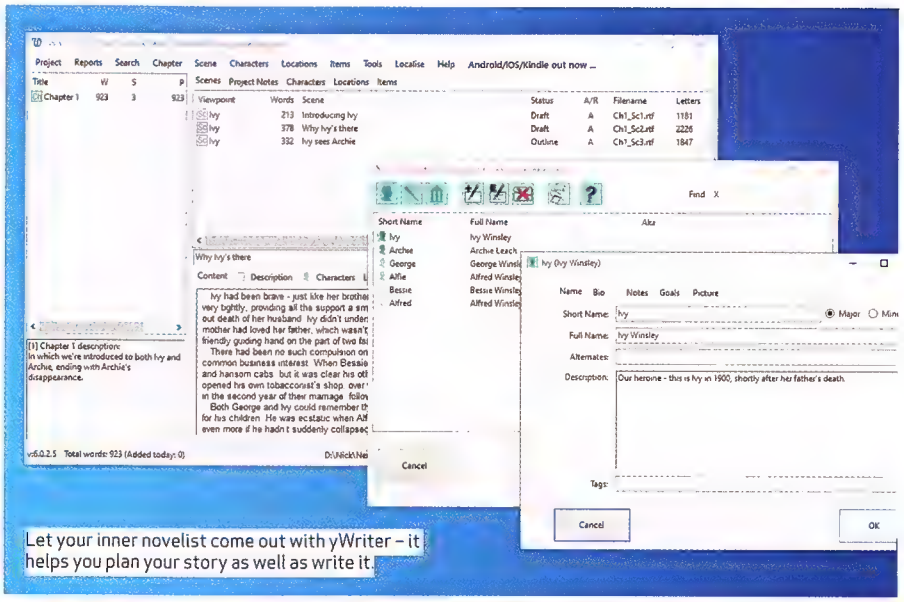
Write and publish a story

Take that idea for a novel that's been bouncing around and get it down on (digital) paper.

They say everyone has a novel in them, but starting with a blank Word document is as off-putting as it gets. What you need is a tool that's geared towards helping you write your story – fiction or non-fiction – and that tool is yWriter (**www.spacejock.com/yWriter6.html**). It's a full-blown project management tool aimed at budding novelists, providing everything you need to plot, structure and – of course – actually write your story. You'll find options to set up and manage characters, locations and objects, plus jot down notes.

yWriter structures your story into sections, chapters and scenes – start by choosing 'Project > New Project Wizard' to create a bare-bones project with title and author name. Then create your first chapter from the Chapter menu followed by its opening scene.

Chapters and scenes come with descriptions – short synopses of their content – and once you've got your first scene up and running you'll see a Viewpoint dropdown menu above its title – this allows you to choose the scene's main protagonist. First, you need to create one or more characters – click Add followed by Add New. Give your character a short name, indicate if they're a major or minor character, then complete the rest of the Name tab. You'll see other tabs – Bio, Notes, Goals and Picture – for recording additional information if needed.



Let your inner novelist come out with yWriter – it helps you plan your story as well as write it.

START WRITING

Use the scene's Content tab's text window to write your story. It has similar options to a word processor, but don't forget to save regularly! You'll also see a range of tabs allowing you to record as much or as little detail you need to help plan each scene, from which characters are in it (along with their motivation) to a list of items and locations. These work in a similar way to characters – right-click under 'Present in Scene' and choose New to set them up.

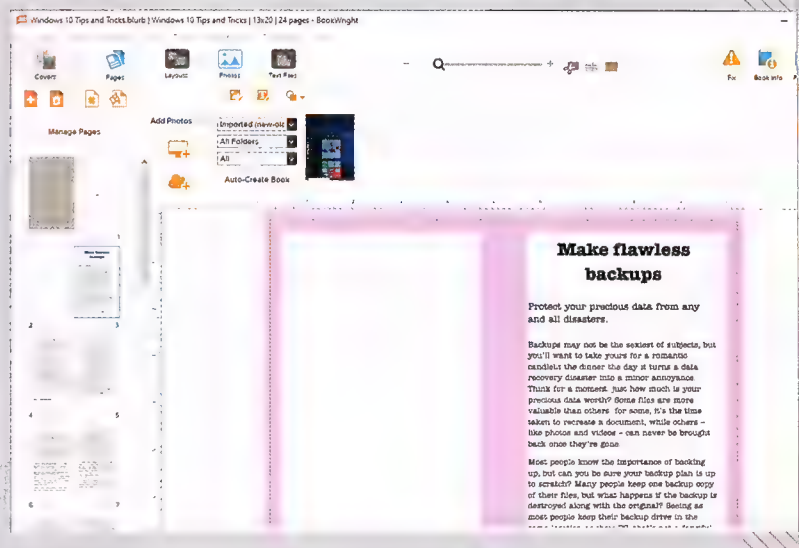
When you're ready to move on to the next scene in your story – you don't need to have finished a scene first – simply select Scene > Add Scene (after current) to do so. The main screen provides a handy summary of chapters and scenes, which you can rearrange from here, plus access as many or as few of yWriter's rich tools as you need. Once your story is complete, choose Project > Export Project to save a copy in formats including text, eBook, RTF and HTML.

Self-publish your work

You've written your story, and now you'd like to share it with a wider audience. These days, an increasing number of authors are self-published, selling their stories directly through stores like Amazon.

One of the best tools for formatting your book and then publishing it – either as a paper product or a digital eBook – is Blurb BookWright (**www.au.blurb.com**). It steps you through the entire process – choose your book type (the cheapest option is a standard 13x20 paperback under Trade), bring your book's elements (text and optionally pictures) together, select a basic layout and watch your book come to life before your eyes.

Once the basic building blocks are in place, you can add images, edit the layouts (and indeed the text itself – including its font and style), add a cover – choose softcover to save money – and finally preview your book before uploading it to your Blurb account from where you'll be able to add an ISBN number and publish it electronically through various online merchants or order physical paper copies for yourself, friends and to sell.



Blurb offers all the tools you need to produce your book, publish it electronically or in print, and even sell it.

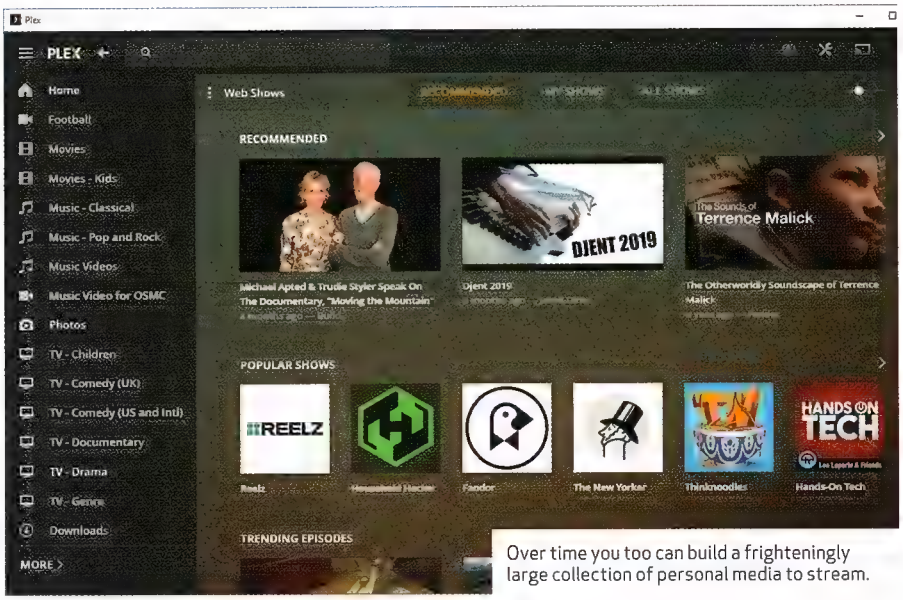
A DIY streaming service

Place all your movies, music and other media in a convenient place with the help of Plex.

These days, we consume media – from music and photos to movies and TV – on a variety of devices in various locations. Digital media is both liberating and yet constricting at the same time. If you've built up a huge media library and want quick and easy access to it from any location, then you need a media server.

A media server allows you to collect all the media you own the copyright to together in one location – your PC's main storage, a USB-attached drive or even a network-attached drive – and then access it from just about any smart device you own – other computers, your phone or tablet, even the set-top box or smart TV in your living room. It provides you with a consistent experience wherever you happen to be, and allows you to start watching on one device, then finish on another without having to manually skip to the right place.

Our media server of choice is Plex (**www.plex.tv**) – it provides an easy way to browse and watch or listen to your media, and thanks to its clever 'On Deck' function, will line up the next episode of a TV show after you've finished watching the current one.



Over time you too can build a frighteningly large collection of personal media to stream.

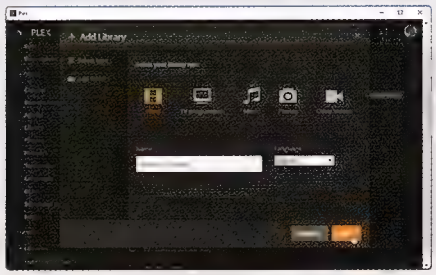
CHOOSE THE RIGHT HARDWARE

Plex should ideally be left running 24/7, so we recommend installing it on a low-power device such as a high-end network hard drive (QNAP, Synology or WD My Cloud) or a Raspberry Pi 3 or 4.

Make sure all your home movies are stored as MP4 files using the H.264 video and AAC or MP3 audio codecs – this is the closest to a universal format you can get, most devices should be able to play it directly. Handbrake (**www.handbrake.fr**) is the best tool for video conversion. Music should be MP3 for the same reason – convert using MusicBee (**https://getmusicbee.com**).

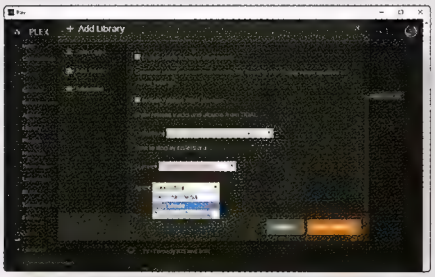
With your media in place, follow the quick-start guide at **https://support.plex.tv/articles/200264746** to download, set up and then start configuring your new streaming media server (see the step-by-step guide). By default, you'll be able to stream media on your own network only; to open access to the internet, select 'Settings > Remote Access' to do so. If you'd like to share your server with friends and family, select Users & Sharing under your account name – the benefit of doing this is that you control which libraries they can access, while they'll also enjoy their own personalised On Deck experience.

Set up a media library



1 LIBRARY BASICS
In the Plex app, click the Settings button. In the left-hand pane, scroll down to the Manage section and click Libraries followed by 'Add Library'. First, select your media type: films, TV, music, photos or 'other' videos (such as home videos). Name it and click Next.

1 SELECT MEDIA FOLDER
Click 'Browse for media folder' – remember it will need to be on a drive that's visible to your server. Click inside the folder box and wait. After a short pause, a list of folders should appear, allowing you to browse to and select the folder containing your media. Click Add.



1 ADVANCED SETTINGS
Select Advanced in the left-hand pane to tweak the library's settings – in most cases these can be left alone, but you may want to choose a different online agent to provide library information about your movies. Click 'Add Library' when you're done and wait for it to be populated.

Learn an instrument

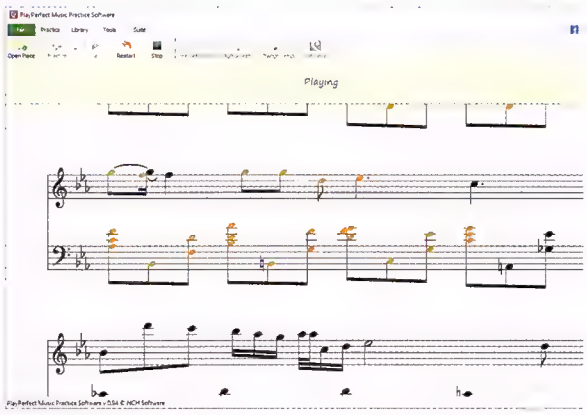
Brush up your skills on the piano, guitar or other musical instrument with your PC's help.

Music is far more than just the food of love – it's nourishment for our very soul. And what better way is there to express yourself than through music? It's never too late to pick up an instrument, whether starting from scratch or picking up where you left off years – or even decades – ago.

The good news is that your PC can provide you with all the support you need to develop your musical abilities as well as record your ongoing progress and even provide you with the means of writing your own pieces.

Start with PlayPerfect (**www.nchsoftware.com/practice/**), a free program to help you practice your instrument between lessons. It provides a series of pieces to play along to through your microphone, using an optional metronome to help with tempo.

During installation you'll be offered several related programs – including PitchPerfect to aid the tuning of your guitar. You'll also be offered Crescendo, a musical notation program for creating and editing pieces to add to PlayPerfect. We'd recommend you skip this in favour of MuseScore (**https://musescore.org/en**). Unlike Crescendo, it's completely free and open source, plus it supports a wider selection file formats, making it easier to source whatever pieces you're currently learning through sites such as **www.free-scores.com** – make sure they're formatted as two staves, and export them from MuseScore as .mid files to use in PlayPerfect. If you have a MIDI keyboard with suitable USB-to-MIDI cable (around $20-$30, try **www.artistguitars.com.au**), then check out LMMS (**https://lmms.io/**), a free recording tool that can be used to record anything from practice sessions to full-blown original compositions.



Import your own scores into PlayPerfect for practice purposes.

FIX PC BOOT PROBLEMS

PC refusing to start? **Nick Peers** guides you through the steps you can take to get things working again

There's not a single PC problem that isn't infuriating, drawing you further and further away from the reason you sat down in front of your computer in the first place. But the most disruptive of them all occurs when your PC suddenly won't start. It may have been brewing for weeks – a slow accumulation of minor glitches growing in intensity – or maybe it came out of the blue.

Either way, what are you going to do about it? That's where we come in. If your PC won't get as far as the Windows logo or even start at all, we'll investigate everything from loose cables to complete hardware failure. If it's Windows that's causing you grief, we'll look at troubleshooting the problem methodically, first with the help of Windows' own repair tools and then with a more powerful – and free – third-party recovery disc.

Finally, for those not already diligently backing up their systems using drive-imaging software, we'll reveal a backup plan that could save you time and effort in the future, revealing how to use it to restore your PC to full working order in a fraction of the time it would take to troubleshoot, never mind reinstall Windows from scratch. Enough cable rattling – it's time to get to work restoring your PC to proper working order.

64 **TROUBLESHOOT HARDWARE**
If you're unable to get as far as the Windows loading screen, determine if your PC's hardware is to blame

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If your problem occurs after the Windows logo appears, then try your luck using Windows' own repair tools

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Windows' recovery disc no help or impossible to navigate? Try a more powerful – and user-friendly – alternative

70 **THE SMART APPROACH**
Now your PC is working smoothly again, create a backup regimen to spare you grief further down the line

Troubleshoot hardware

If you're unable to get as far as the Windows loading screen, determine if your PC's hardware is to blame.

Step one of the troubleshooting process is to identify whether your problem is hardware or Windows-related. If your PC powers on, passes its initial checks (known as the POST, or Power On Self Test) and gets as far as the Windows logo before things go wrong, your problem is likely to be related to your Windows installation – turn the page to find out how to diagnose and fix it.

If you can't even get as far as this, then your problem is likely to be linked to your hardware – it may be a simple physical problem or something more fundamental like component failure. Here's what you need to do.

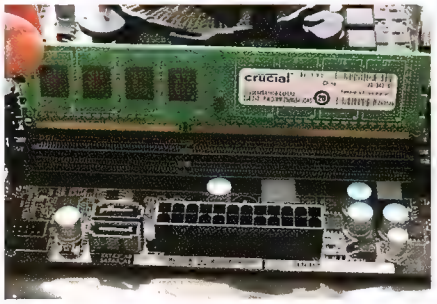
Choose a replacement power supply with equal or greater output (in watts) than the original one.

PC won't power on at all

If nothing happens – literally – when you press the power button then start with the obvious physical checks: is the power cable plugged in at both ends and switched on? Is there a power switch on your PC that may have inadvertently been knocked to the off position? You'll find it near the power socket on the back of your computer.

No luck? If your monitor cable is the same type as your PC's, try using that to eliminate your PC's cable (or its fuse) as the cause. Try a different plug socket (or try a different appliance in that socket). If after all this you're still not getting anywhere, then you'll need to switch off the PC at the socket, earth yourself – see box below right – and then open up your PC's case to examine its innards – there may be a possible short-circuit (gently tilt the PC case in various directions to see if it dislodges a stray screw, for example).

Still no luck? Your power supply may have died – if the PC's under warranty you'll need to speak to

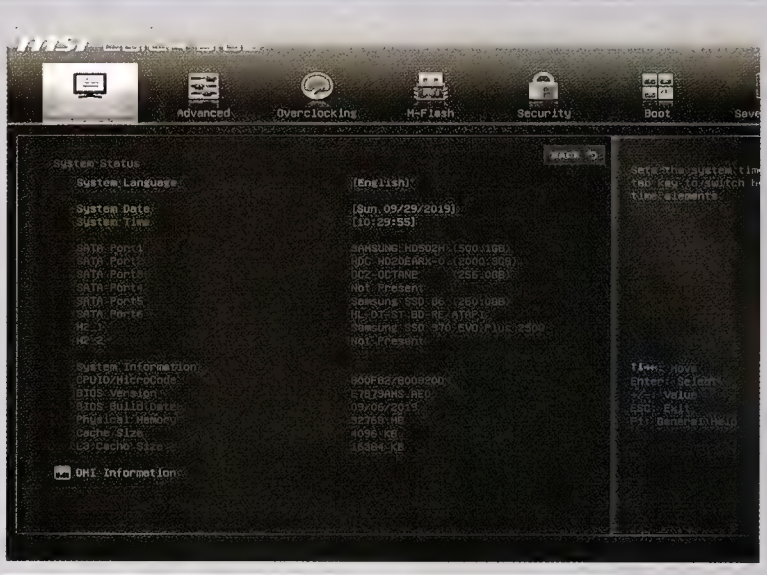


Check key components like your RAM are securely seated – chip creep is a common problem.

Hard drive failure

If your PC completes the POST, but then throws up an error about not finding a bootable operating system, start by restarting your PC, then tapping the key (typically Del or F2) to enter the BIOS (also known as the UEFI or Setup Utility). Look to see if your Windows drive has been detected – if it's not showing in the BIOS, check the drive cables inside your case. Still no luck? There's a possibility the drive itself has physically failed – if possible, remove it and use an external enclosure, drive caddy or USB-to-SATA adapter (around $5 on eBay) to connect it to a working PC and see if it's recognised and its contents accessible.

If the drive is recognised by your BIOS, but you still can't access it, boot from a Lazesoft Recovery Suite rescue disc to see if it can see it (and its contents). If all else fails, you'll need to replace the drive, then restore your image-based backup (such as Macrium Reflect Free) to your new drive following the guides further on this feature.



Use the BIOS to verify if your hard drive is present and recognised. If it isn't, it may have failed or become disconnected from the motherboard.

your manufacturer; otherwise open up the case and make a note of the current PSU, a square block that (if it's a standard ATX PSU) should be straightforward to swap out and replace. Look for one with a power rating that's at least equal to the original (and preferably more powerful – 500 watts or greater) and comes with enough connections to power your PC's disparate components, and all the right plugs to connect to them.

Before unplugging and removing your old PSU, make a note of which sockets it's plugged into on your motherboard as well as which drives are connected to it. Take a photo or two to help remind you where your new PSU will need to be plugged into after it's been fitted.

OTHER HARDWARE PROBLEMS

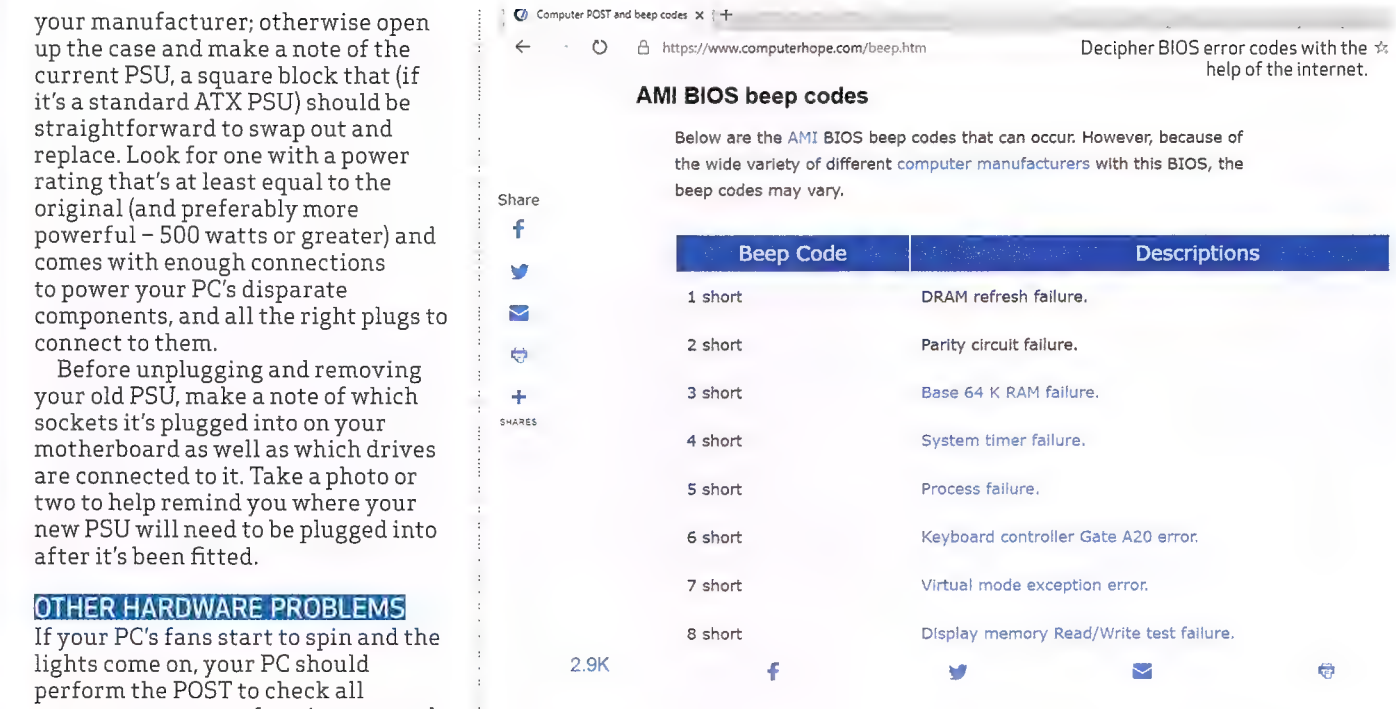
If your PC's fans start to spin and the lights come on, your PC should perform the POST to check all components are performing correctly. Listen out for beeps or an error code on-screen, which you can investigate on a working PC – try your motherboard or PC manufacturer's manual or web site (look under Support) or view the generic guide to what beep codes mean at **www.computerhope.com/beep.htm** – this will hopefully help you determine where the fault lies.

The likelihood is that one or more components have failed or – if you're lucky – become dislodged. Focus your initial investigation on your memory, graphics card, processor and motherboard. Check for 'chip creep', whereby components can work themselves free – push gently down on any cards and your RAM to see if they click back into place.

If you suspect faulty RAM, remove all but one stick and try booting again, swapping out one stick for another until things come back to life or you've eliminated it as the cause of your problem.

Next, try stripping back your PC's components to the essentials: unplug all external peripherals except the mouse, keyboard and monitor. Still no luck? Open the case to unplug all internal drives and carefully remove any add-in cards (apart from your graphics card) to see if that brings things back to life. If it does, reconnect everything carefully to see if the problem has no cleared itself; if it returns, you'll need to unplug everything and connect the bits back one at a time to pinpoint the troublesome component.

If you only get power, but no beeps, then the problem may lie with your motherboard (or possibly the processor). It may have have suffered from a component failure, in which case you can safely consider it dead, but you should probably get in touch with the manufacturer or enlist professional help to confirm the diagnosis and obtain a replacement. This may require a trip to the second-hand market if your PC is getting on in years and you don't want to end up replacing motherboard, processor and RAM.



Decipher BIOS error codes with the help of the internet.

An anti-static wrist-wrap, an anti-static mat like the above, or working with your back against a radiator are all ways around the static problem.

Earth yourself

Don't take risks when opening your PC case or handling its sensitive innards. They're susceptible to static electricity, which we humans are masters at producing. If you can afford it, we recommend investing in an anti-static wrist strap (widely available on eBay for as little as $5). Attach the wristband to your wrist and clip the other end on to your PC case to provide an earth to safely discharge any static build-up. If you don't have access to a wrist strap, another way to discharge static safely is to ensure your PC remains plugged into the mains, but that the mains switch itself is off – this then uses the cable and socket as an earth.

If you plan to handle sensitive components like motherboards outside of your PC case you should also invest in an anti-static mat to place it on.

Other tips: avoid carpeted floors, polyester and nylon clothing and consider working barefoot. Also make sure to keep yourself grounded by periodically touching the PC case.

Windows boot problems

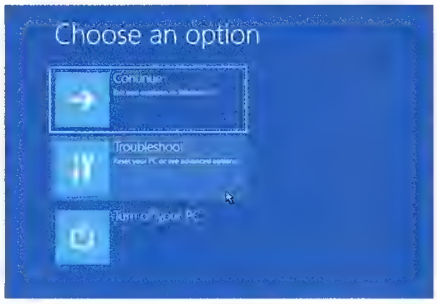
If your problem occurs after the Windows logo appears, then try your luck using Windows' own repair tools.

First, the good news: your hardware appears to be in good working order. Now the bad news: finding out what's happened to Windows. There are two routes to follow here: the first involves Windows' built-in repair tools, summarised opposite. The problem may be accessing them.

Windows' first recourse is its own Start-up Repair tool, which should run automatically after a failed attempt to load. If it fails to fix the problem after several attempts, it should bring up the advanced start-up tool with the all-important Troubleshoot button under 'Choose an option'.

ACCESS START-UP REPAIR

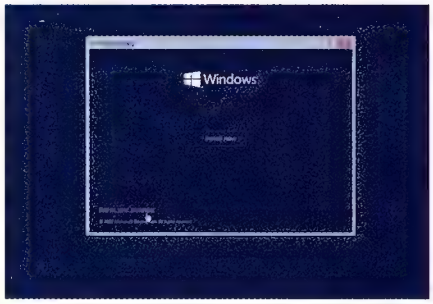
If this fails to appear you can try interrupting the boot sequence manually as soon as you see the Windows logo appear by pressing the reset button to trigger the advanced start-up tool, but if Windows still won't play ball (or you find yourself in an endless reboot loop), then you're going to need the services of rescue media – see the box below if you don't have this potential lifesaver to hand, or turn the page to make use of a more powerful alternative.



Windows' built-in tools can be accessed via the Troubleshoot button.

If you'd like to give your Microsoft installation media the opportunity to try and fix your problem, insert the flash drive or DVD and start your PC. Look for an option to choose the boot device before the Windows logo appears, press the key and then choose your DVD or USB drive from the list (if it appears twice, select the UEFI option).

You should see the Windows logo appear as before, and eventually you'll reach the Windows Setup screen. Verify the language settings are correct, then click Next followed by 'Repair your computer' to bring up the same set of options found in the advanced start-up tool. Click Troubleshoot followed by 'Advanced options' if necessary, then follow the step-by-step guide to work your way through the available options.



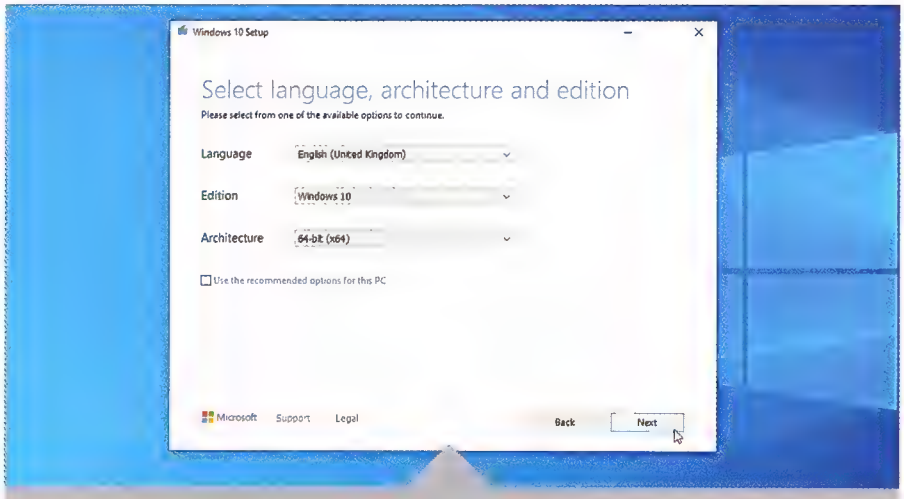
You can access the Windows repair tools from your installation media.

TESTS AND REPAIRS

The Start-up Repair tool performs a series of tests to try and locate a cause (and fix) for your problem. If you're unable to find a fix, make a note of the path to the file SrtTrail.txt – this contains details of what tests were performed and what actions were taken. Now open the Command Prompt (see step five) and type the following, substituting C:\ for whatever drive Windows has been allocated – on our test machine it was E:\ for example:

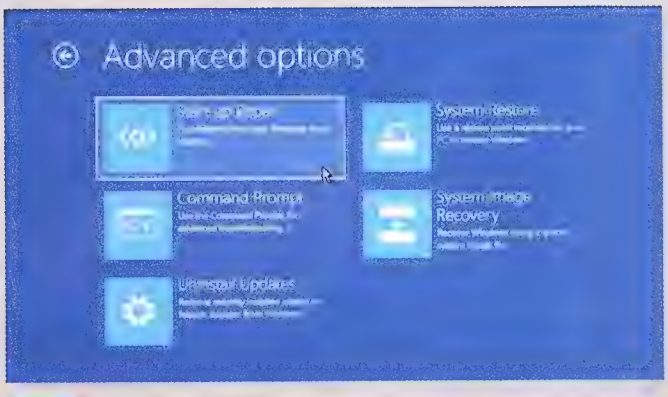
```
cd C:\Windows\System32\
logfiles\srt\
SrtTrail.txt
```

The file's contents will be displayed, allowing you to review its findings and pinpoint problems the Start-up Repair tool may have been able to identify without being able to fix – for example, corrupt boot files. When it comes to applying manual fixes, the bootrec tool is just one several available to you from the Command Prompt. Others include diskpart, chkdsk and DISM. Typing the tool's name and pressing Enter will bring up a list of supported commands for that tool, but if you find it all a little off-putting, you should turn the page where you'll find automated fixes involving these very tools are all part of the Lazesoft Recovery Suite.



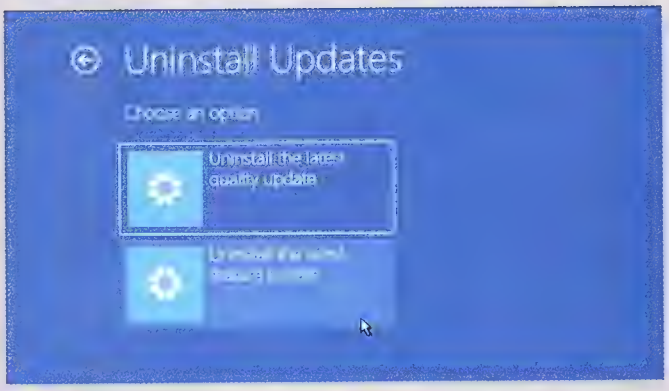
Build recovery media

If necessary, switch to a working PC and download the Media Creation Tool from www.microsoft.com/software-download/windows10 - once done, launch the tool. When prompted, choose 'Create installation media' after plugging in your flash drive or inserting a blank DVD and click Next. Verify the language, edition and architecture are the same as your affected PC (untick the 'recommended options' box and change them if not – use 'Both' for Architecture if not known). Click Next, choose whether to create a USB flash drive or create an ISO file for DVD, then click Next and follow the wizard through to its end, clicking 'Open DVD burner' if applicable.



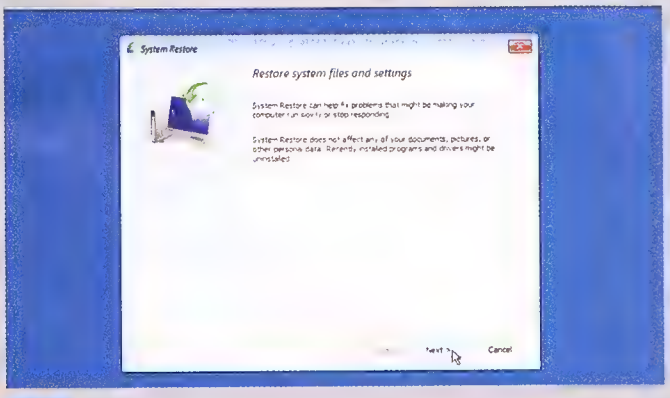
1 TRY THE AUTOMATIC FIX

Click 'Start-up Repair' to see if Windows can detect and fix your problem. Chances are it can't – it's already run this when Windows wouldn't start – but sometimes it takes two or three attempts before a fix is applied. If it fails, reboot to the main troubleshooting screen and move on to the next step.



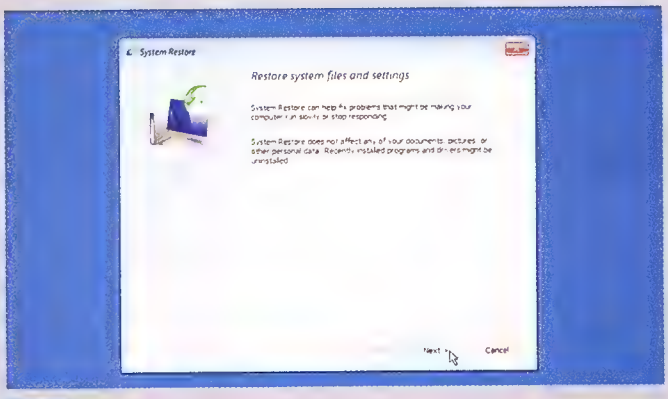
2 REMOVE MALFUNCTIONING UPDATES

If you're unable to start Windows after installing a recent feature or quality update – typically a major update like the 1909 update or a cumulative update – then try 'Uninstall Updates'. First, choose the type of update you want to remove, select Windows 10 and finally click the uninstall button.



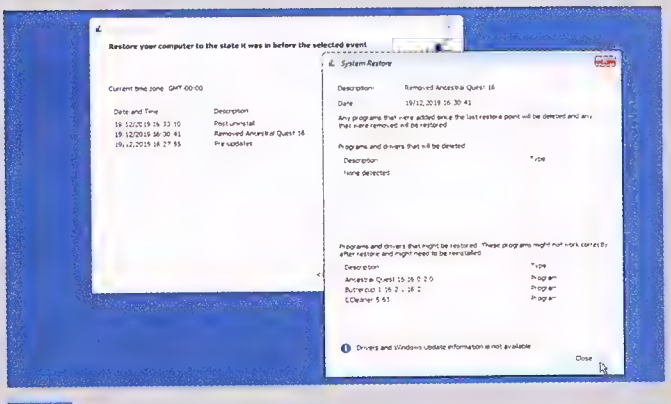
3 USE SYSTEM RESTORE

System Restore is disabled after major Windows updates, but if you remembered to switch it back on, you may be able to reverse other changes responsible for your boot-related woes. Select it from the menu, then click Windows 10 and wait for it to load.



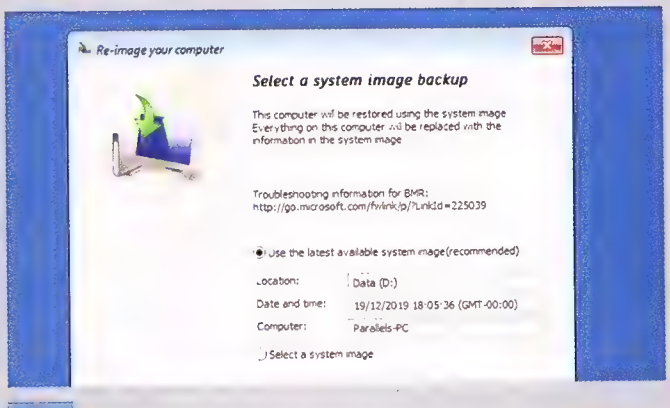
4 CHOOSE A RESTORE POINT

A list of all available Restore Points will be shown. Choose the latest one and click 'Scan for affected programs' to see what drivers and applications will be affected. Make a note, then click Next followed by Finish to roll your system back.



5 ACCESS COMMAND PROMPT

Advanced users who troubleshooting a problem where Windows won't even start loading may wish to try the bootrec tool via the Command Prompt option on the main screen. Type bootrec and press Enter to get a detailed list of the four supported commands – the safest one to try is 'bootrec /FixMbr'.


Re-image your computer
Select a system image backup
This computer will be restored using the system image
Everything on this computer will be replaced with the information in the system image
Troubleshooting information for BMR:
http://go.microsoft.com/fwlink/p/?LinkId=225039
Use the latest available system image (recommended)
Location:
Data (D:)
Date and time:
19/12/2019 18:05:36 (GMT-00:00)
Computer:
Parallels-PC
Select a system image

6 SYSTEM IMAGE RECOVERY

If you've been using the Backup and Restore (Windows 7) tool to back up your entire hard drive via a system image, your final option is to restore the last backup taken using the System Image Recovery tool. It should detect your latest image and roll your PC back to a working state.

The ultimate rescue disc

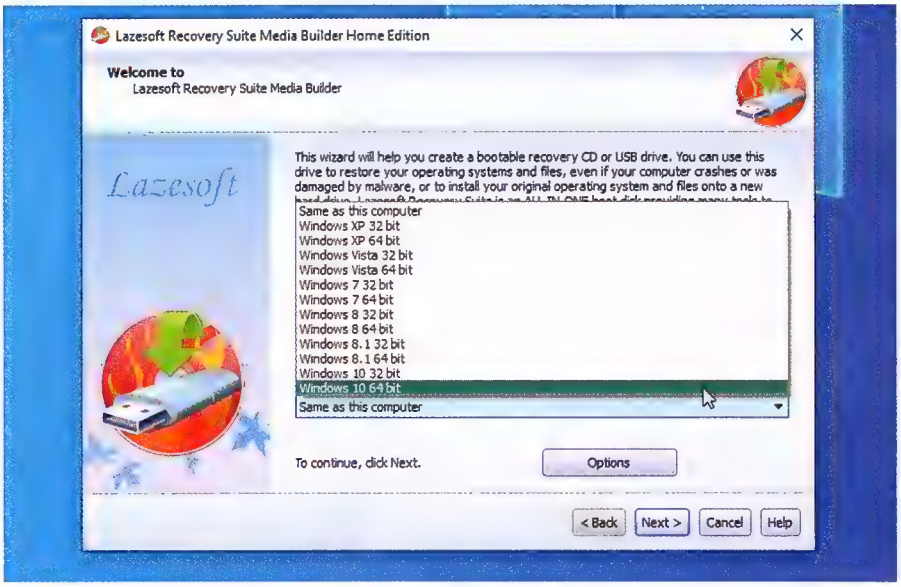
Windows recovery disc no help or impossible to navigate? Try a more powerful – and user-friendly – alternative.

Windows' built-in repair tools can only do so much – if you find them falling short, then it's time to call in the cavalry. Lazesoft Recovery Suite is our go-to tool when it comes to taking on stubborn boot problems. Not only does it offer a wider range of repair tools, but there are also tools for recovering data from crashed (but readable) drives as well as the option of taking a fail-safe image of your entire corrupted Windows installation, ensuring you won't lose any files even if you end up with no other choice but the nuclear option (see box below).

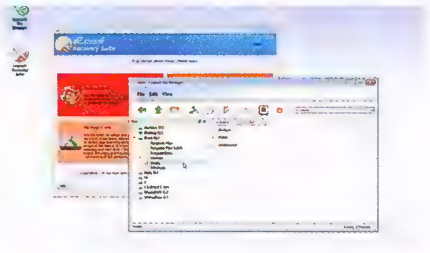
In an ideal world you'll have a Lazesoft recovery disc or USB flash drive ready to go, but if not you'll need access to a working PC. Browse to www.lazesoft.com on that and click Download, choosing the free Home Edition download. Once downloaded, install the program and click the 'Burn CD/USB Disk' option.

If your working PC is running a different version of Windows, select the correct version from the dropdown menu before clicking Next. Choose your target device – CD or flash drive – and click Start, then wait for the process to complete.

Once created, eject the recovery media and transfer to it your non-working PC. Switch it on, bring up the boot menu when prompted and then select your drive (again, choose UEFI if there's a choice). When the Windows Boot Manager appears, leave 'Lazesoft Live CD (EMS Enabled)' selected and press Enter. You'll eventually find yourself at the Lazesoft desktop – similar to Windows – with Lazesoft Recovery Suite Home pre-loaded.


Lazesoft Recovery Suite Media Builder Home Edition
Welcome to
Lazesoft Recovery Suite Media Builder
Lazesoft
This wizard will help you create a bootable recovery CD or USB drive. You can use this drive to restore your operating systems and files, even if your computer crashes or was damaged by malware, or to install your original operating system and files onto a new
Same as this computer
Windows XP 32 bit
Windows XP 64 bit
Windows Vista 32 bit
Windows Vista 64 bit
Windows 7 32 bit
Windows 7 64 bit
Windows 8 32 bit
Windows 8 64 bit
Windows 8.1 32 bit
Windows 8.1 64 bit
Windows 10 32 bit
Windows 10 64 bit
Same as this computer
To continue, click Next.
Options
< Back
Next >
Cancel
Help

Be sure to select the correct version of Windows for your afflicted PC when creating your rescue media.

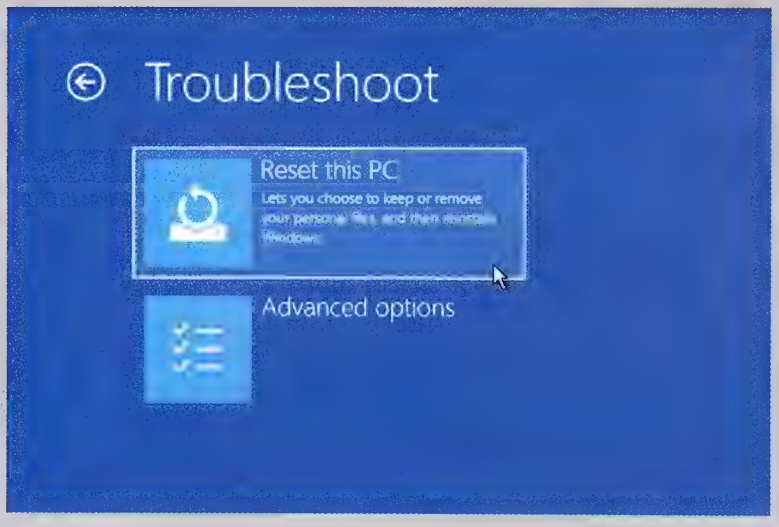


Lazesoft Desktop looks like the Windows desktop but is dedicated to fixing problems.

Time to reinstall?

If you're unable to get Windows working in any form, and you have no recent backup to fall back on, then you're left with two options: a full-blown reinstall. If Automatic Repair is unable to fix your PC and gives you the option, choose 'Advanced options' followed by Troubleshoot and finally 'Reset this PC'. Start by with the 'Keep my files' option – you'll see there's no option to preserve your apps. This – the equivalent of a repair installation – is only available through Windows.

There's also an option to reset and remove everything, but we're inclined to suggest that if you're going to go down this route – having backed up everything first of course – that a brand new install using your Windows installation media is the better choice. This allows you to wipe the drive and start from a completely clean slate with the latest version of Windows (1909) in place and raring to go.



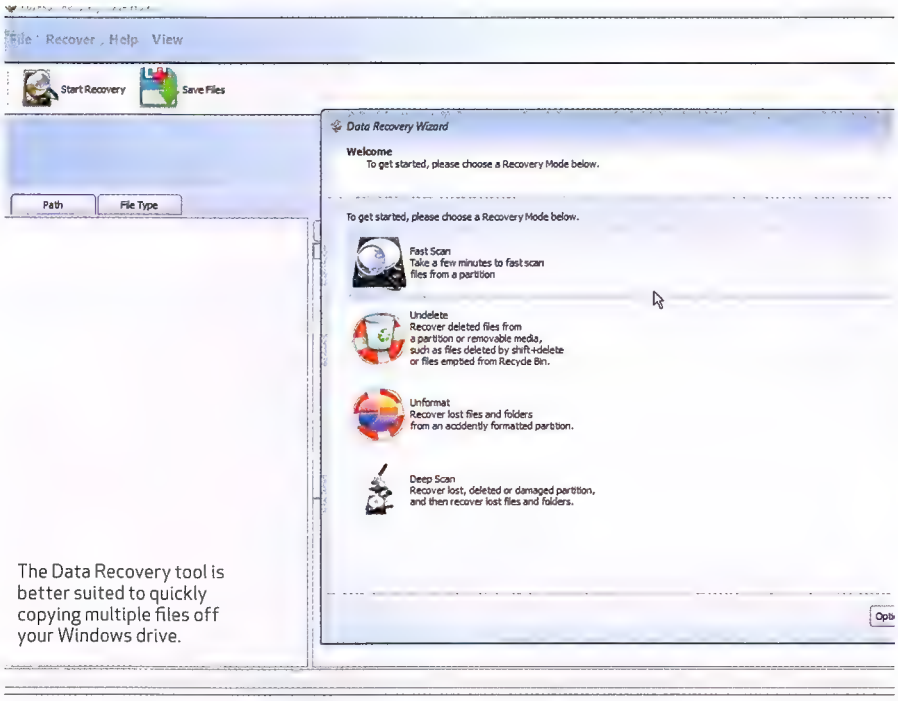
Resist the temptation to dive straight in with the Windows Recovery option and instead take a tour of the desktop – click the Start button and you'll see access to various tools including the ability to change the desktop resolution if it's a bit cramped.

RECOVER DATA FROM A DRIVE

If there's data on your drive you've not backed up, you should first take steps to copy it to a backup drive. If you plan to copy it over the network you'll first need to assign the network drive a letter: click Start and choose 'Map Network Drive' first. Specify its address (try its IP address in place of its server name if you can't connect), select a drive letter and enter the required network credentials if necessary.

The Lazesoft File Manager icon on the desktop provides a simple two-pane file explorer tool for manually copying individual files and folders, or you can make use of the Data Recovery tool, which can transfer regular files as well as recover deleted files and files from lost partitions. Select your scanning level (choose 'Fast' for non-recovery scenarios), choose the drive containing your data and click Start Search. After a short period you'll be able to search the drive by file path or file type, then select which files you want to recover before clicking 'Save Files' to select a drive and folder to copy them to.

If you're not sure which files you might be missing, back up the entire drive: click 'Disk Image & Clone' followed by 'Backup (Drive to Image)'. Select drive C and click Next. Leave Full Backup selected and click Browse to select your destination followed by Start to take the backup. Should you need to recover files from this drive image in future, install Lazesoft on your PC, then launch it in Windows. Open 'Disk Image & Clone, then click 'Browse Drive Image File' under Drive Image.

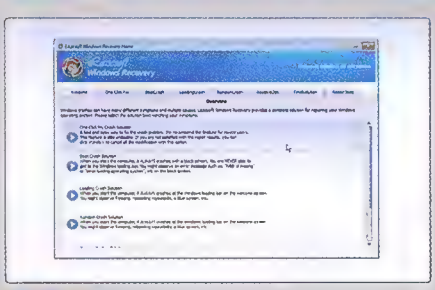

File Recover Help View
Start Recovery
Save Files
Data Recovery Wizard
Welcome
To get started, please choose a Recovery Mode below.
Path
File Type
To get started, please choose a Recovery Mode below.
Fast Scan
Take a few minutes to fast scan files from a partition
Undelete
Recover deleted files from a partition or removable media, such as files deleted by shift-delete or files emptied from Recycle Bin.
Unformat
Recover lost files and folders from an accidently formatted partition.
Deep Scan
Recover lost, deleted or damaged partition, and then recover lost files and folders.
The Data Recovery tool is better suited to quickly copying multiple files off your Windows drive.

REPAIR WINDOWS

You've got failsafe backups in place, now it's time to task Lazesoft with hopefully fixing your Windows installation. The step-by-step guide details how to work your way through the Windows Recovery tools – there's Windows tools like System Restore and System File Checker (buried away under RepairTools > Additional Tools) plus some of Lazesoft's own making – the Registry Recovery tool being one such example.

Windows Recovery helps steer you towards the appropriate solution for your symptoms – if the one-click option has no effect, take the time to select each tool and read its description, which includes a guide to the types of symptoms the tool can remedy. After all this, if you're still unable to get Windows to work, however, it's time to bite the bullet and look to repair or reinstall Windows. See the box below for details.

Repair Windows with Lazesoft

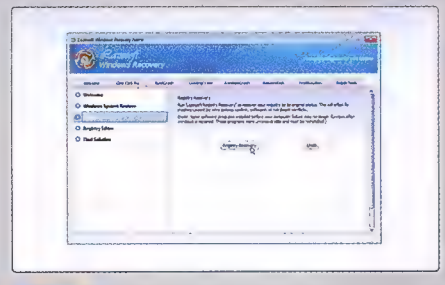


1 THE ONE-CLICK FIX

Open Windows Recovery, select your Windows installation if necessary and click OK. At the Overview screen, start by clicking the 'One Click Fix Crash Solution' option. Click 'One Click Fix' to run the wizard. Review the results and click Finish.

2 TRY A SPECIFIC FIX

If the one-click fix doesn't solve your problem, examine the BootCrash tab where you'll see a selection of individual tools from MBR Repair to Missing Windows File Repair. Select one and if it matches your symptoms, click the button to apply it.



3 KEEP SEARCHING

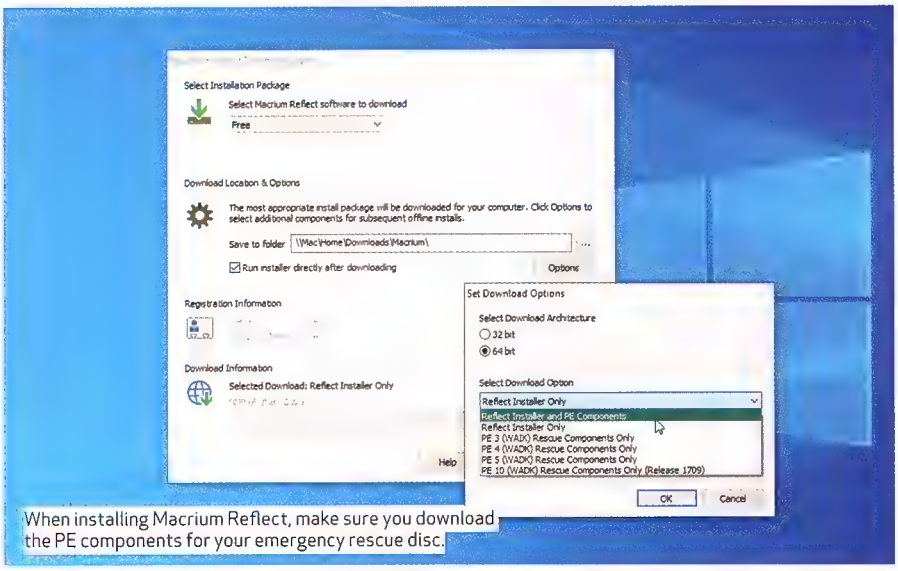
The LoadingCrash tab offers more tools, including shortcuts to System Restore and a Registry Recovery tool. This latter tool will attempt to detect – and fix – Registry corruption. Some programs may need reinstalling if this succeeds, so use it as a last resort.

The smart approach

Now your PC is working smoothly again, create a backup regimen to spare you grief further down the line.

The simplest way to resolve boot problems is to effortlessly roll back to a moment before the glitch occurred. No wasted time troubleshooting, no heart-in-mouth moments as you wonder if you'll ever see your data again. Instead, a brief tut-tut followed by the restoration of your latest backup, and on you go.

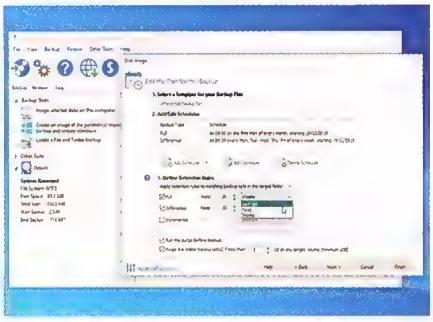
This approach requires you to have a back-up plan in place, so if you've not already done so, download and install Macrium Reflect Free (**www.macrium.com/reflectfree.aspx**). During setup, be sure to click Options under 'Download Location & Options' to select 'Reflect Installer and PE Components'. This will download the components required to create the all-important recovery media, for which you'll need a spare CD, DVD or USB flash drive (1GB or larger is recommended, but you may get away with 512MB). We recommend the USB drive route – it's much quicker to load.


Select Installation Package
Select Macrium Reflect software to download
Free
Download Location & Options
The most appropriate install package will be downloaded for your computer. Click Options to select additional components for subsequent offline installs.
Save to folder
\\Mac\Home\Downloads\Macrium\
Run installer directly after downloading
Options
Registration Information
Download Information
Selected Download: Reflect Installer Only
Help
Set Download Options
Select Download Architecture
32 bit
64 bit
Select Download Option
Reflect Installer Only
Reflect Installer and PE Components
Reflect Installer Only
PE 3 (WADK) Rescue Components Only
PE 4 (WADK) Rescue Components Only
PE 5 (WADK) Rescue Components Only
PE 10 (WADK) Rescue Components Only (Release 1709)
OK
Cancel
When installing Macrium Reflect, make sure you download the PE components for your emergency rescue disc.

SET UP BACKUP

Once downloaded and installed, insert your flash drive or blank disc, launch Macrium Reflect and choose 'Other Tasks › Create Rescue Media'. Select your target drive from the menu, then click Build. Wait for the process to complete, then safely eject your drive. Test it by rebooting your PC and pressing the key prompted to bring up the boot menu. Select your USB drive (choose the UEFI option if more than one entry is present) and it should boot to the main Macrium user interface. Once you've verified it works, reboot to Windows proper, then open Macrium again.

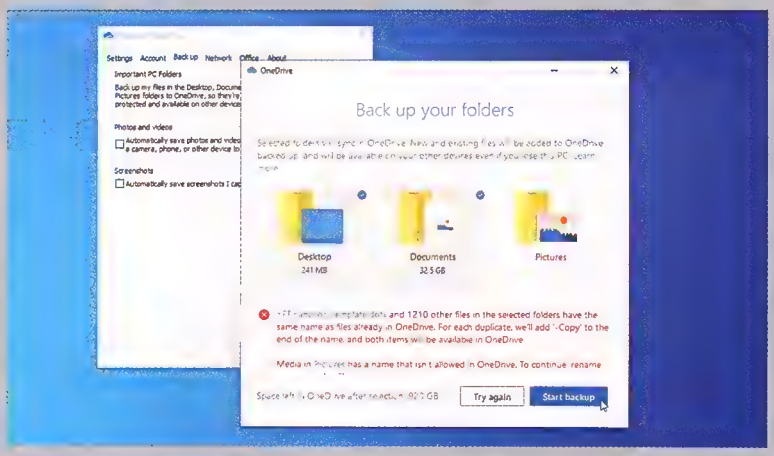
You're now ready to put your backup in place to protect your entire system – or Windows setup if you've partitioned your drive to keep data


You can tweak all aspects of your backup schedule, plus set how many backups to keep.

Protecting your data

Your personal files – photos, documents, media files and so on – change more frequently than Windows. While rolling back your PC a day or even a week won't have too disruptive an effect on your programs, you could find yourself losing hours or even days of work. If you've not moved your key data folders to another partition or drive, we recommend you store your key data in your cloud provider's folder – OneDrive being the obvious example – so the latest version is always being synced.

When you roll back your PC, the older versions of your files will be restored to disk, but your cloud provider should detect this and download the latest versions of your files back to your PC automatically. Keep a close eye on the process – you may in some cases get a file-conflict error, which will need resolving (navigate to the folder, compare both versions and delete the older one – you may find the time stamp of both versions is helpful, but don't assume anything without manually reviewing each version of the file).



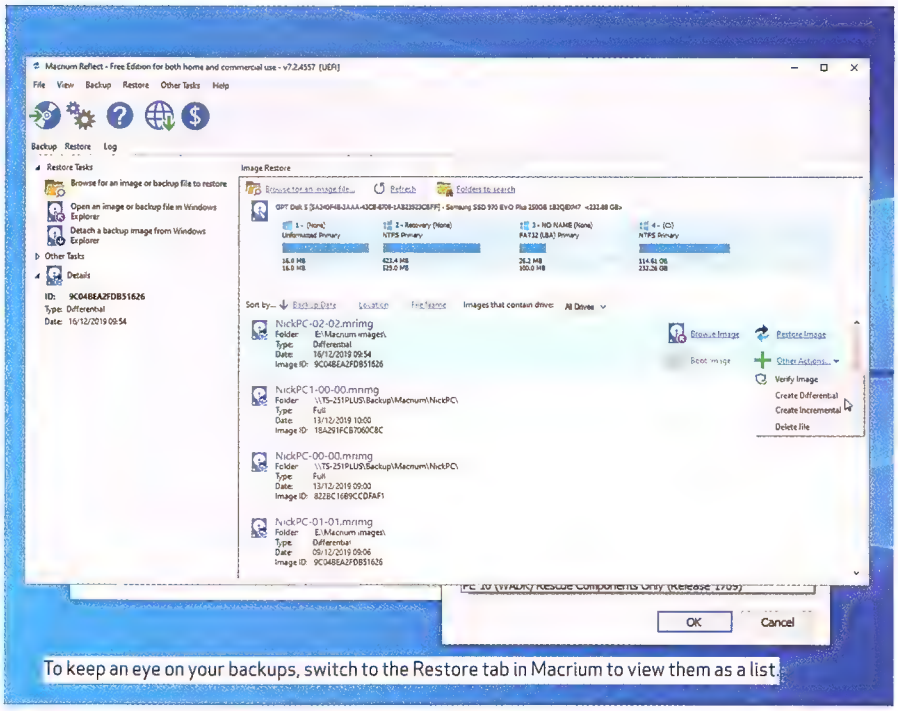
Ensure your personal files are being backed up separately to the cloud using a trusted cloud provider. For extra security, put the synced folder for one service in that of another.

separate from it. Click the 'Create an image of the partition(s) required to backup and restore Windows' button. You'll see two or three partitions are selected. Click the ... next to Folder under Destination to choose your backup drive – typically an external USB hard drive or network storage. Once done, click 'Advanced Options > Auto Verify Image' and tick the 'Verify image...' box before clicking OK followed by Next.

Here's the key part of the process: setting a schedule for backing up your system. Macrium offers full and differential backups – differential backups are smaller because they simply record the changes made since the last full backup was taken but require the full backup is present to work. If you have enough drive space, we recommend choosing the 'Differential Backup Set' under the Template drop-down menu. This creates one full backup a month, and a differential backup daily (weekdays only), so you'll never have to roll back more than 24 hours into the past.

To preserve disk space, full backups are kept for six months, and differential backups for 30 days before being deleted, but Macrium offers a handy 'purge' setting that deletes the oldest backup sets if your backup drive space falls below a certain level (5GB by default, but you can alter it from here). Alternatively, you can edit the retention rules – which define how many backups are kept. Try setting a specific number – 2 or 4 – for full backups, while holding on to differential backups for up to two weeks only.

Once you've configured your backup plan, click Next to review your settings (click Back to make changes).



To keep an eye on your backups, switch to the Restore tab in Macrium to view them as a list.

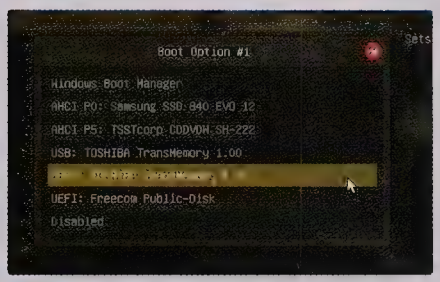
Once you're happy, click Finish, verify 'Run this backup now' is ticked and then click OK to take your first backup. From now on, Macrium will update your system backup in the background following the schedule you set – you'll be prompted each time the backup's about to run in case you want to postpone it for any reason.

RESTORING YOUR BACKUP

With your backups in place, you can now get on with your daily life, knowing that in the event of disaster, you can easily roll back your PC. All changes since the backup was taken are wiped out – including your data, which is why you should check out the box to ensure it's backed up separately to potentially save hours of work from being lost.

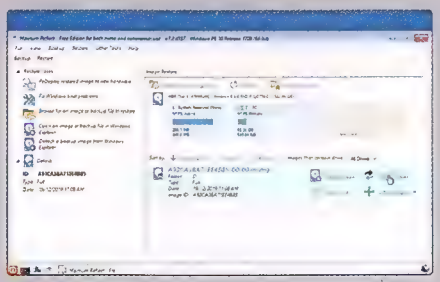
If disaster strikes, restoring your backup is as simple as following the step-by-step guide below. Your corrupt Windows installation will be overwritten by the last working version and you should find you're able to boot back into Windows again. If problems persist, consider rolling back to an earlier backup, but remember – the further back you go, the more changes (including newly installed programs and drivers) you'll lose.

Roll back Windows



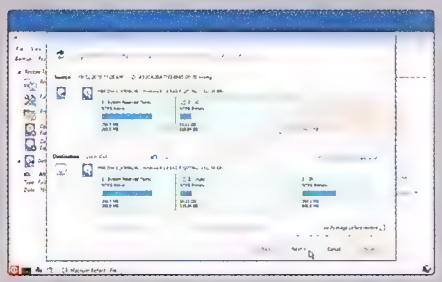
1 BOOT FROM RESCUE MEDIA

Insert your rescue media and start your PC. Look for an option to select the boot menu and press the key, then select your rescue media from the list (choose the UEFI option if the media appears twice). Wait for the familiar Macrium Reflect interface to load.



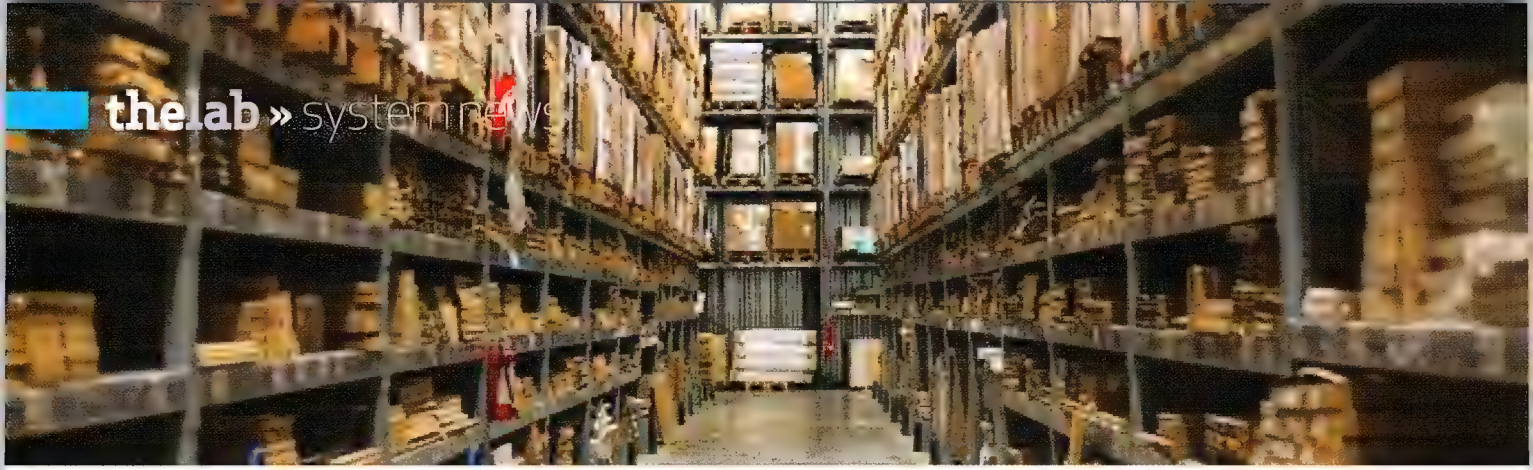
2 SELECT BACKUP TO RESTORE

Your backups should be detected and appear in the Image Restore tab. If a particular backup doesn't appear, click the 'Browse for an image file...' button to manually locate it. Once done, click 'Restore Image' next to the latest backup in the list.



3 VERIFY DESTINATION, THEN RESTORE

Verify your backup matches the destination drive, which should be your Windows drive. If necessary, drag the partitions from the top to their corresponding locations at the bottom. Click Next followed by Finish. Review the warning, tick the box and click Continue.



System News

With the coronavirus now affecting much of our lives, Mark Williams looks at its effects on the PC and tech industry.

As the coronavirus spreads through the community, governments have acted, which has led to the rise of people staying at home for extended periods of time, be it for self-isolation or to work from home. Where much of the economy is feeling the pain of falling or no patronage thanks to social distancing rules and forced closures of many venues, the tech sector is experiencing something of a boom. Staying or working at home means people need IT hardware like computers, monitors, keyboards to either keep themselves entertained or productive in their job remotely.

As our two industry contacts reveal in Shop Talk, computer stores are finding it hard to keep up with demand, not only because of the increased demand itself, but because China went into lockdown months ago due to COVID-19, stopping PC parts production that much of the world relies on. While many of these suppliers are now ramping production back up as China eases its restrictions, there will be a continued strain on supplies while we ride out the production lag time.

Jaimie from Leader Computers said: "Supply has definitely been affected, but things are starting to come back online now as vendors retool factories from outside the immediately affected zones in Wuhan and the surrounds."

"I think it will be a tough ride through till at least the end of the financial year to be honest and could easily stretch through to September. The problem is the Australian market is very small compared to US and Europe etc, so it is very hard to get stock allocations here."

All this computer equipment is for nothing without the network to connect them all, the internet. NBN Co has been collaborating with governments and RSPs to ensure capacity as the usage demand increases. Leading NBN to offer RSPs a waiver on overage fees for up to 40% higher traffic flow for the next few months so that prices and bandwidth remain accessible during this period.

The likes of Youtube, Amazon Prime and Netflix in Europe are reducing video streaming quality so as to not choke local internet infrastructure and Google has said it would stop or minimise updates to its Chrome browser for a while to provide as stable a browsing platform for those now heavily reliant on it.

Remote desktop access companies are having a field day with companies implementing work from home strategies. TeamViewer, for example, is seeing such a high demand for its products it is commissioning more servers to cope with the demand and has even cut prices on its top tier enterprise plans by half so that smaller entities not normally the target for such products can find it accessible and benefit from what it has to offer.

Valve's popular gaming service Steam has also broken records for the most players online at any one time (currently over 22 million) and players concurrently in games (over 7 million players), showing just how much gaming has spiked as people search for things to do in isolation. Xbox and PlayStation networks have also touted large increases in player volumes too.

While we all wait for a vaccine, you can help contribute to the scientific fight against COVID-19. The long running Folding@Home project has added COVID-19 as a project you can donate spare compute time towards to help scientists understand the virus better. People are flocking to the project to help and has seen a normally steady active user count of 10,000 explode to well over 150,000 in the space of just two weeks.

If your PC is sitting idle at home and you'd like to help the scientific effort, head on over here to get started **https://foldingathome.org/covid19/**

SHOP TALK

How has the coronavirus affected your business and the wider PC builder market?

Jaimie, Leader Computers:

"There is a huge demand for IT equipment with people getting ready to work from home, attend school from home, and even some businesses trying to capitalise on the tax incentives put in place by the government in an attempt to bolster the stalling economy.

Match that huge demand with a rapidly falling Aussie dollar and limited supply due to slowed production out of China and you get panic buying akin to the current toilet paper situation.

The most popular equipment is obviously laptops and monitors, but then there are all the ancillary items, such as headsets and IP phones, keyboard/mouse kits, printers, webcams, network routers that support the secure network infrastructure of the employer, and even office furniture like chairs and desks.

While our customers are currently flat out supplying this demand, we don't know how long this bubble will last, and recommend that they watch their cash flow carefully for when it likely bursts!"

Richard, Aftershock PC:

"We have actually found that since the virus hit, our sales numbers have increased. Demand seems to have gone up while supply is proving very difficult to manage. This seems to be to do with both people spending more time at home, as well as the 'get in early before the prices rise' mentality in the community.

One of the big challenges is the Australian dollar, which is really jumping the prices of components. The combination of higher prices and shortages all over the place is certainly making things tricky.

Our operations have not had to change much as yet; however, we are well-prepared for any lockdowns that may occur."

Market Snapshot

A sampling of PC systems available this month.

Aftershock Zeal

$2,437 – TINYURL.COM/APC480AFT

In what appears to be a Lian Li PC-O11 Dynamic chassis, but is actually a 'clone' design of one, this build offers unobstructed views through the front and side tempered glass windows.

The image shown also showcases a glimpse of the customisation possible beyond the recommended configuration we're showcasing, with RGB fans and a different graphics card shown but it should help illustrate how good looking a system is possible if you start piling on the RGB add-on options at checkout.

The specs all around are quite solid, offering a well-matched CPU and GPU combination with a good storage configuration and perfect memory speed choice. A well specced out system for 1440p gaming.

KEY SPECS: CPU: AMD Ryzen 5 3600X, **COOLER:** Aftershock Spectra Glacier 240 AIO, **MOTHERBOARD:** Asus B450 TUF Gaming Plus, **GRAPHICS:** Zotac RTX 2070 Super AMP 8GB, **MEMORY:** 16GB Apacer Zadak Moab RGB 3600MHz, **STORAGE:** 512GB M.2 NVME SSD, 2TB 7200RPM HDD, **POWER SUPPLY:** 600W FSP / EVGA, **CASE:** Zeal Tempered Glass Showcase Edition.

JW Computers Ready to Go Office PC

$588 – TINYURL.COM/APC480JWC

Need to work from home and just need a barebones minimalistic PC to let you browse the web, remotely connect to work and do basic computing tasks with? It doesn't get much cheaper than this!

Being so cheap, there are plenty of compromises made. Interestingly, memory and storage weren't one of them with a nice 8GB of system RAM which is enough for most office work situations, and a SATA SSD which is sizeable enough and will keep the system snappy.

The two biggest compromises are the CPU and the motherboard. The CPU is good enough for general office work, remote desktop connection and web browsing, but don't expect much beyond that.

KEY SPECS: CPU: Intel Pentium Processor G4560, **COOLER:** OEM, **MOTHERBOARD:** Asus B250 Mining Expert, **GRAPHICS:** iGPU, **MEMORY:** Crucial 8GB DDR4 2666MHz, **STORAGE:** Crucial BX500 240GB 2.5in Sata SSD, **POWER SUPPLY:** Tsunami Power Supply Unit, **CASE:** Tsunami P43.

PLE Vital Home

$749 – TINYURL.COM/APC480PLE

Costing quite a bit more than the circa 2017 JW system, if you're wanting something a bit more modern to work from home with this is ideally what you should be aiming at. Although we would suggest at checkout opting for the AMD 3000G CPU instead for an extra $6, which will net you an extra 300MHz (3.5GHz) of CPU clock speed and an unlocked multiplier if you're into that sort of thing.

The motherboard and the SSD is this systems' biggest assets over the JW system. Double the SSD storage capacity is always welcome, but the motherboard gives you the entry level experience of AMD's current platform, giving you more IO to play with like M.2 expansion and upgrade paths down the track.

KEY SPECS: CPU: AMD Athlon 200GE, **COOLER:** OEM, **MOTHERBOARD:** Asus Prime A320M-K, **GRAPHICS:** iGPU, **MEMORY:** GeIL 8GB DDR4 Pristine C19 2666MHz, **STORAGE:** Kingston SSDNow A400 480GB 2.5in SSD, **POWER SUPPLY:** eVGA GD Series 600W, **CASE:** Fixita Essent E103.

Scorptec Ryzen 3200G Office PC

$799 – TINYURL.COM/APC480SCP

The most expensive of the home office PC's this month, this system earns its stripes thanks to a superior CPU offering. The star of the show in this build is AMD's 3200G, which compared to the PLE and JW systems offers up base and boost clocks of 3.6GHz and 4.0GHz respectively based on the slightly enhanced Zen+ architecture. Combined with the fact that is has double the core and thread count, it means you can expect upwards of 25% better computing performance over the others.

Where this build slightly falls down is the 2400MHz memory, which is slower than what the PLE system has and is less than the CPU's supported 2933MHz, meaning there'll be a small performance loss. Also, the 240GB SSD while M.2, is not NVMe, so not only is it not faster than a SATA SSD, it also occupies a potential upgrade slot.

KEY SPECS: CPU: AMD Ryzen 3 3200G, **COOLER:** OEM, **MOTHERBOARD:** Gigabyte A320M-S2H V2, **GRAPHICS:** iGPU, **MEMORY:** Kingston ValueRAM 8GB 2400MHz DDR4, **STORAGE:** Western Digital WD Green 240GB M.2 SSD, **POWER SUPPLY:** Thermaltake 500W, **CASE:** Thermaltake Versa H21.

PC blueprints

The *APC* team's picks for a part-by-part perfect PC build to suit your budget.

PARTS LIST

PART		PRICE
CASE	BITFENIX NOVA TG	$95
PSU	CORSAIR CX450M R4.0 AM4	$75
MOTHERBOARD	ASROCK B450M R4.0 AM4	$105
CPU	AMD RYZEN 5 2600	$199
GPU	ASUS GEFORCE GTX 1660 SUPER OVERCLOCKED 6GB PHOENIX EDITION **NEW**	$389
RAM	16GB (2X 8GB) GEIL EVO POTENZA @ 3,000MHZ **NEW**	$115
SSD	120GB ADATA SU650 SATA III	$30
HDD	1TB WD BLUE HDD	$59
OS	UBUNTU DESKTOP LINUX 18.04.3 LTS 64-BIT	$0
APPROXIMATE PRICE:		$1,067

We saw minor price rises in many areas this month; the case, processor, memory, and hard drive all rose; only by a few dollars each, but enough to add up. We weren't able to keep our price low without a significant downgrade, so we've opted to steer into the skid, upgrading the memory to 8GB from 16GB to future-proof this build. We went for a slight speed bump, too, without throwing too much on the price: Geil's Evo Potenza memory fits the bill perfectly. Elsewhere, we chose a 1660 Super GPU with superior clock speeds: Asus's factory-overclocked Phoenix Edition, which has a gaming mode clock of 1,800MHz, higher than the boost clock of the EVGA card it replaces.

PARTS LIST

PART		PRICE
CASE	FRACTAL DESIGN MESHIFY C	$149
PSU	500W SILVERSTONE ET500 BRONZE	$59
MOTHERBOARD	ASROCK X570 PHANTOM GAMING 4	$248
CPU	AMD RYZEN 5 3600X	$369
COOLER	AMD WRAITH SPIRE	N/A
GPU	GIGABYTE RADEON RX 5700 8GB	$549
RAM	16GB (2X 8GB) GEIL EVO POTENZA @ 3,000MHZ **NEW**	$115
SSD	500GB SEAGATE FIRECUDA 520 M.2 PCIE SSD **NEW**	$209
HDD	1TB WD BLUE HDD	$59
OS	WINDOWS 10 HOME 64-BIT OEM	$140
APPROXIMATE PRICE:		$1,782

We made the same memory adjustment for this build as for the Budget system, although it was less of an upgrade and more of a price-balancing move. The 16GB Evo Potenza kit from Geil is great value right now, and keeping the price down on this build was certainly challenging this month. With that in mind, a sale on the PCIe 4.0 Seagate FireCuda made it better value than the Sabrent Rocket we used last issue, so we switched back to Seagate's SSD. While we looked into shifting the processor and GPU to different options, ultimately it simply wasn't worth it; the Gigabyte RX 5700 remains the best-value model of that card on the market, and the Ryzen 5 3600X is still on sale for a perfectly good price.

UPGRADE OF THE MONTH

16GB (2x 8GB) GeIL Evo Potenza @ 3,000MHz

$115, WWW.GEIL.COM.TW

It's truly incredible how much memory pricing has shifted over the last few years. The ability to buy 16 gigabytes of high-speed RAM for a mere 115 dollars might seem almost absurd to tech heads who have been building PCs for years; even more recent recruits to the system-building community have to admit that memory is in a very affordable place right now. GeIL's Evo Potenza memory is fantastic value, an ideal way to upgrade to the 16GB mark if you're still rocking a 4GB or 8GB system. 16GB will leave any system well equipped for the next generation of hardware and software, and now is a good time to make that leap.

"The GPU has been swapped out again, also moving over to EVGA for its RTX 2080 Super model. Most 2080 Super GPUs would work fine in this build; if you're looking to assemble a Turbo PC, keep an eye on the sales."

The twin Seagate HDDs are still great value for money, and we're not upgrading to a third-gen Threadripper either; the 2950X provides amazing performance for the price, and an upgrade would make the overall cost of this build untenable. Even the cheapest third-gen Threadripper retails at more than double the current cost of the 2950X.

For cooling our options are limited when it comes to sTR4 socket compatibility. We've gone for a three-fan Fractal Design Celsius model to replace the previous Cooler Master, which ought to keep that giant CPU cool. We're also replacing the power supply to keep our price from rising too much, using EVGA's 850W PSU from the SuperNOVA line.

We've got other upgrades, too. The GPU has been swapped out again, also moving over to EVGA for its RTX 2080 Super model. Most 2080 Super GPUs would work fine in this build; if you're looking to assemble a Turbo PC, keep an eye on the sales. The last change we made was some new memory, a collaborative work between Team Group and Asus to produce the T-Force Vulcan TUF Gaming Alliance RAM series. Yes, it's a wordy honorific, but this is good hardware, combining Team Group's affordable approach to RAM with Asus's "TUF" rigorous testing and manufacturing ethos.

PARTS LIST

PART		PRICE
CASE	NZXT H700I	$229
PSU	850W EVGA SUPERNOVA 850 G+ 80+ GOLD **NEW**	$230
MOTHERBOARD	ASUS PRIME X399-A	$279
CPU	AMD THREADRIPPER 2950X	$1,179
COOLER	FRACTAL DESIGN CELSIUS S36 BLACKOUT 360MM **NEW**	$199
GPU	EVGA GEFORCE RTX 2080 SUPER BLACK GAMING 8GB **NEW**	$1,179
RAM	32GB (2X 16GB) TEAM T-FORCE VULCAN TUF GAMING ALLIANCE @ 3,600MHZ **NEW**	$300
SSD	1TB GIGABYTE AORUS GEN4 NVME M.2 PCIE	$388
HDD	2X 3TB SEAGATE BARRACUDA COMPUTE	$360
OS	WINDOWS 10 HOME 64-BIT OEM	$140
APPROXIMATE PRICE:		$4,483

Put together a Party PC

Build a gaming PC you can take to a friend's place.

Do you miss LAN parties? We do. The steady erosion of split-screen multiplayer and improvements to online play mean that the tradition of gathering at your best friend's house, setting up bulky CRT monitors, and connecting cables all over the place so that you could all play *Quake II* together is a distant memory.

Well, the LAN party isn't dead just yet – at least, not if we've got anything to say about it. We've got a challenge for you: Grab a few friends and a few drinks, and set up as many systems as you can in one room for a proper old-fashioned game night. So, this month, we're going to be building a compact PC designed to be taken over to a friend's place for a spot of co-op (or competitive) gaming.

This gave us a few preordained necessities to work around. An ITX form factor motherboard was basically mandatory, squeezed inside a small case. However, we also needed a decent graphics solution; integrated graphics on an APU simply wouldn't cut it here, so a discrete GPU was needed. Alongside all this, we also needed a decent amount of memory and an SSD – hard drives are too bulky for compact builds.

The other element we wanted to capture was portability. No, this won't be a system you can break out on the bus, but it needed to be light enough to carry around easily and compact enough to fit comfortably in the trunk of a small car. Minimal internal cabling and a low-profile CPU cooler were also preferable features, and we knew there had to be at least some RGB lighting – this is a gaming PC, after all.

"We've got a challenge for you: Grab a few friends and a few drinks, and set up as many systems as you can in one room for a proper old-fashioned game night."

COUCH COMPONENTS

Our compact case was an easy choice: Cooler Master's MasterCase H100. It's one of the best ITX cases we'd seen in ages, and guess what – it comes with a carry handle on top, too. It was a no-brainer.

The rest of our list was more complex. We needed an ITX motherboard, so reached out to Asus for a ROG Strix B450-I Gaming. A recent price drop made this high-quality board more affordable, so we couldn't say no. It's worth noting that new B450 boards purchased from Asus now come pre-flashed, making them compatible with second and third-gen Ryzen CPUs straight out of the box.

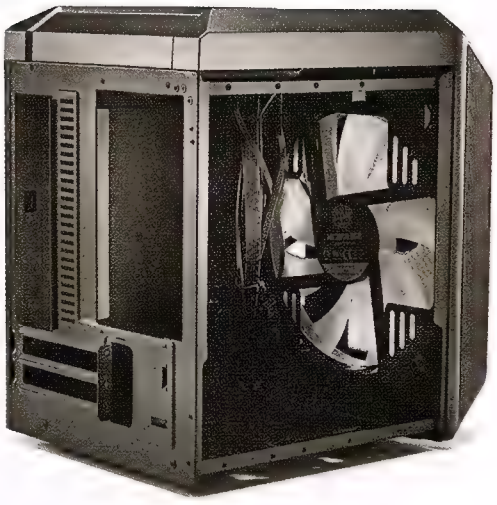
We're using the Ryzen 7 2700; a last-gen chip, but it remains a solid eight-core CPU. We're not using a third-gen Ryzen chip to keep the price down. B450 chipset boards don't support PCIe 4.0, so we wouldn't be able to take advantage of an ultra-speedy fourth-gen M.2 SSD anyway. It had to be M.2, though, rather than a larger SATA SSD – being able to install the drive directly to the motherboard means one less cable getting in the way. With that in mind, we selected XPG's 512GB Gammix S10 SSD.

We're using the stock cooler that comes with the CPU, the AMD Wraith Spire. Fortunately for us, it just falls below the maximum CPU cooler clearance for this case. The reason for the minimal cooler clearance is simple: In order to save space, the MasterCase H100 requires you to mount your PSU vertically alongside the motherboard, at the top-rear of the case.

Our PSU is Fractal Design's excellent Ion+ 560P, a fully modular power supply for just 100 bucks. We needed a small GPU, too, so we've gone for Gigabyte's GTX 1660 Ti XLR8, a single-fan factory overclocked model of Nvidia's excellent mid-range GPU. Lastly, we've got 16GB of Micron's 2,400MHz Ballistix Sport RAM.

PARTS LIST

PART		STREET PRICE
CASE	COOLER MASTER MASTERCASE H100	$89
MOTHERBOARD	ASUS ROG STRIX B450-I GAMING	$219
CPU	AMD RYZEN 7 2700	$299
CPU COOLER	AMD WRAITH SPIRE	N/A
MEMORY	16GB (2X 8GB) BALLISTIX SPORT LT WHITE @ 2,400MHZ	$98
GPU	GIGABYTE GEFORCE GTX 1660 TI 6GB GAMING	$419
PSU	560W FRACTAL DESIGN ION+ 560P 80+ PLATINUM	$179
SSD	XPG GAMMIX S10 512GB	$125
HDD	WINDOWS 10 HOME 64-BIT	$140
OS	WINDOWS 10 HOME 64-BIT	$N/A
TOTAL		$1,568



2 SMALL PACKAGES

Start by stripping down the case. Only one side panel can be removed from the MasterCase H100, so take that off and set it aside. You can remove the plastic front cover – it pops off easily – but there's no need. You do, however, need to remove the two expansion card blanking plates and the mounting bracket for the PSU at the rear. To prep it for later, remove the PSU block from its box and screw the bracket on to it, using four of the larger screws from the H100's accessory bag. Keep this bag handy; it also has cable ties and the screws you need to secure the mobo (we aren't using the included RGB controller, though). Lastly, make sure the front I/O cables are neatly secured to one side, so they don't get in the way when it's time to install the motherboard.

2 SHIELD BEARER

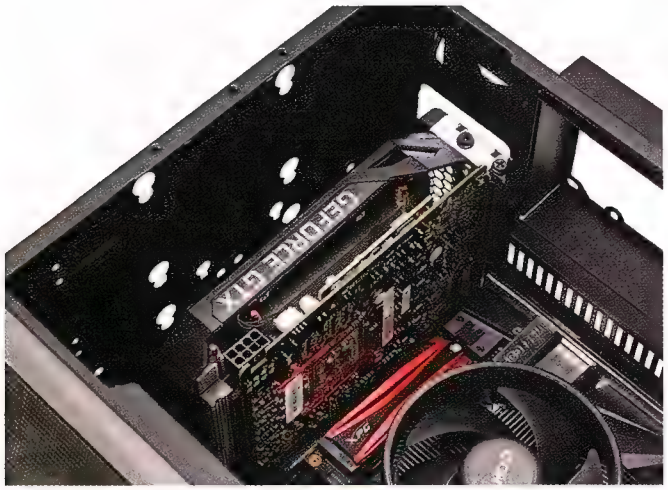
Begin this build proper with motherboard assembly. Start with the M.2 drive; the Gammix S10 comes with its own heatsink attached, so rather than remove that, we'll simply go without the heat shield that comes on the motherboard. Unscrew it at both ends (being sure to store the screws in the B450-I's box), and slot the SSD into the M.2 port. Push the drive down and screw it into place using the tiny silver screw – it should be situated in the stand-off, but if not, you'll find it by itself in a tiny bag in the motherboard box. With the drive in place, move on to the memory. This is simple: Release the clasps at one end of the DIMM slots, then push each stick down until it clicks into place at both ends. Don't be afraid to apply a little force; you'll know when the sticks are secure.

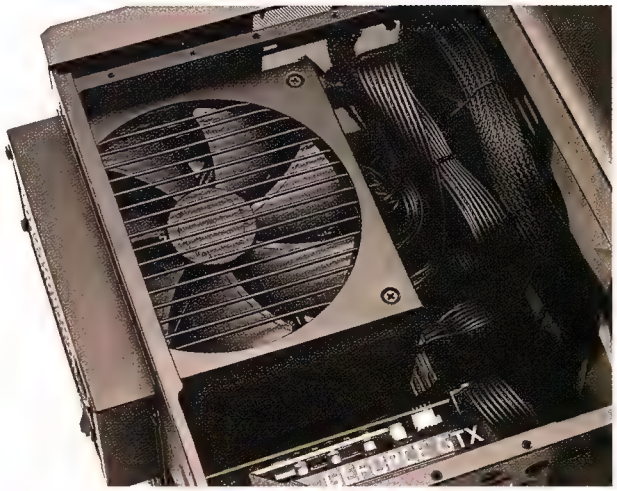
3 CONCEALED COOLING

Don't make the mistake of assuming that fitting the cooler once the motherboard is inside the case is easier. It isn't. Raise the retention arm and slot the CPU into the socket, lining up the triangle markers in one corner, then lower the arm to secure it. With that done, you'll likely need to remove the plastic brackets from either side of the socket; we only need the metal backplate to install this cooler. Once the plastic parts are unscrewed, deposit a small glob of thermal paste on the CPU and lower the Wraith Prism on to it, lining up the four screws with the holes in the mobo. Screw it to the backplate until it's secure, then plug it into the CPU fan header on the board. You can unplug the RGB cable; you won't be able to see the small light ring once the PSU is fitted, anyway.

4 MOUNT AND MADE

Let's mount that motherboard. This can be a somewhat awkward process thanks to the cramped interior of the case, so get everything set up first. You need four of the small motherboard screws from the case accessories bag, as well as the rear I/O shield that came with the board. Slot that into place on the back of the case, then carefully lower the motherboard into position, ensuring that it lines up properly with the holes in the I/O shield. You may need to hold the board in place to get the first screw in, as the back of the shield is squishy and pushes the board off its stand-offs if you release it. Focus on the two screws closest to the shield first, and the other two should come into place.





5 GRAPHIC VIOLENCE

We had a few ideas for which GPU should go in this build. Our original plan was to use AMD's RX 5500 XT, but our unit proved too large for the case. So, we delved back into the storeroom to examine our options. First up was a Gigabyte GTX 1050; a twin-fan affair that was small enough, but not as powerful as we'd like. We settled on the GTX 1660 Ti, also from Gigabyte, with one larger fan. Before fitting it, though, connect all the front I/O cables to the motherboard, the small form factor means these can be awkward, especially the tiny button control cables. Once these are all in place, lower the GPU carefully into the case and push it into the PCIe slot until it locks into place, then screw it down at the rear of the case using the two screws you removed from the blanking plates earlier.

6 HIGH POWER

Lastly, the power supply. Due to the limited space, the best approach is to plug in the cables first – the large ATX cable, CPU power cable, and PCIe cable for the graphics card – and feed them out through the back of the case. Connect them to the PSU, then turn the case on its front (with the front cover on if you removed it) and lower the PSU into the slot so the fan is facing out from the case. Screw it down, then it's time for cable management. The large exposed fan means that loose cables need to be kept out of the way, so we recommend using cable ties to bundle the power and I/O cables separately. There are few points to anchor cable bundles to in this case, but the drilled slots in the metal frame that mounts the case fan can be used, if you snip off any excess cable tie length.

1 We had to remove the PSU for this shot, because it effectively blocks the view of everything inside the case. The modular design is a lifesaver here.

2 The Wraith Spire fits snugly underneath the power block, which isn't ideal, but there's still enough space for the cooler to draw in sufficient air for cooling.

3 The large fan at the front of the case isn't too loud, and does a fantastic job of keeping powerful airflow within the case. It's also impressively vibrant.

4 A single fan means that the GPU fits perfectly inside this case. The GTX 1660 Ti is also the ideal GPU for a competent 1080p gaming system.

Ready To (LAN) Party

There were upsides and downsides to this build. We were satisfied with the GPU's performance at 1080p, as it comfortably handled our gaming benchmarks and the single fan kept it cool. In fact, this build ran cold throughout our testing; the case fan is brilliant, keeping the whole motherboard chilled. The CPU idled below 30 C, and even heavy stress-testing barely saw temperatures rise much higher than 60 C.

At these low temperatures, the Ryzen 7 2700 performed well, making good use of its 16 threads. We don't overclock our CPUs for benchmarking, but the 2700 definitely has the headroom. Ryzen Master's auto-overclocking options are useful if you prefer not to meddle with the BIOS. Perhaps we should've selected a third-gen Ryzen chip, but we're happy with the numbers.

Had we done that, it would have driven the price up significantly. We'd have wanted an X570 motherboard, and the selection of ITX boards with that chipset is limited, plus the price would've risen by close to a hundred bucks. We would be able to use a PCIe Gen 4.0 SSD, however, and the Gammix S10 drive was the main weak point of this build.

While the SSD was well priced and outperformed any SATA III drive we could have used, the numbers were lower than we'd hoped for. A good M.2 SSD should be able to hit at least 3,000MB/s read speeds, but the S10 peaked below 2,000MB/s across multiple tests. In practical terms, though, this shouldn't be much of a problem for a gaming build; M.2 drives are so much faster than HDDs that games should load quickly anyway. The difference between the S10 and a faster SSD probably means load times of two seconds instead of one in many games.

Power-wise, we might have wanted a less powerful PSU. The Ion+ is good, but 560W is more than we need. However, a fully modular supply was necessary due to the case, and it's hard to find a good one under $200. Cable management was hard enough already; introducing excess cables from a non-modular PSU would be a nightmare.

Connectivity-wise, both the motherboard and GPU work well. Our LAN-party-inspired choices mean this rig can be hooked up to a monitor or TV via DisplayPort, HDMI, or DVI ports. The lack of USB-C ports is a shame, but between the front and rear I/Os there are eight USB-A ports, so plugging in multiple controllers for a spot of couch gaming is an option, too. There are a few things we'd change if we built this PC again, but we're reasonably happy with how it turned out. ■

BENCHMARK RESULTS

	ZERO-POINT	THIS SYSTEM
CINEBENCH R15 MULTI (INDEX)	1,152	1,553 (35%)
CRYSTALDISK QD32 SEQUENTIAL READ (MB/S)	3,400	1,808 (-47%)
CRYSTALDISK QD32 SEQUENTIAL WRITE (MB/S)	1,720	879 (-49%)
RISE OF THE TOMB RAIDER (FPS)	60	99 (65%)
TOTAL WAR: WARHAMMER II (FPS)	46	61 (33%)
TOM CLANCY'S GHOST RECON WILDLANDS (FPS)	39	51 (31%)
3DMARK: FIRE STRIKE (INDEX)	11,101	14,627 (32%)

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Our zero-point consists of an AMD Ryzen 5 1600, 16GB Crucial Ballistix Sport LT @ 2,666MHz, an EVGA GeForce GTX 1060 3GB and a 250GB Samsung 960 Evo M.2 PCIe SSD. All tests performed at 1080p at the highest graphical profile.

how to

» QUICK TIPS

Experts solve your computing problems

The APC team tackle problems across the spectrum of devices and software we use. Learn a new trick or fix you can use.

WINDOWS

FIX WINDOWS UPDATE

My laptop has stopped installing updates since the 1903 update a couple of months ago. It gets to seven percent, then rolls back. Can you help?
Raymond Whitehall

We stepped Raymond through all the standard procedures, including downloading the update manually and running the built-in troubleshooter under 'Settings > Update & Security > Troubleshoot'. We also helped him take his first ever system backup using Macrium Reflect Free (**www.macrium.com/reflectfree.aspx**) in case anything disastrous happened with our more root-and-branch repairs.

Once done, the next step was to elicit the help of the free version of Windows Repair. Download and install it from **www.tweaking.com** – once done, you'll need to reboot into Safe mode. To do this, press Win-R, type "msconfig" and press Enter. Switch to the Boot tab, tick 'Safe boot' and select Network, then click OK. Reboot when prompted and you should be taken straight to Safe mode.

Now open Windows Repair and work through the four steps (you can skip the power reset in this instance). The pre-scan is crucial for determining the Windows Package Files are all present and correct (ignore any reparse errors). Run a file-system check (click Check) – if errors are found, run a reboot and check to fix them. Finally, don't skip the System File Check – this is where you may come across corruption that needs repair.

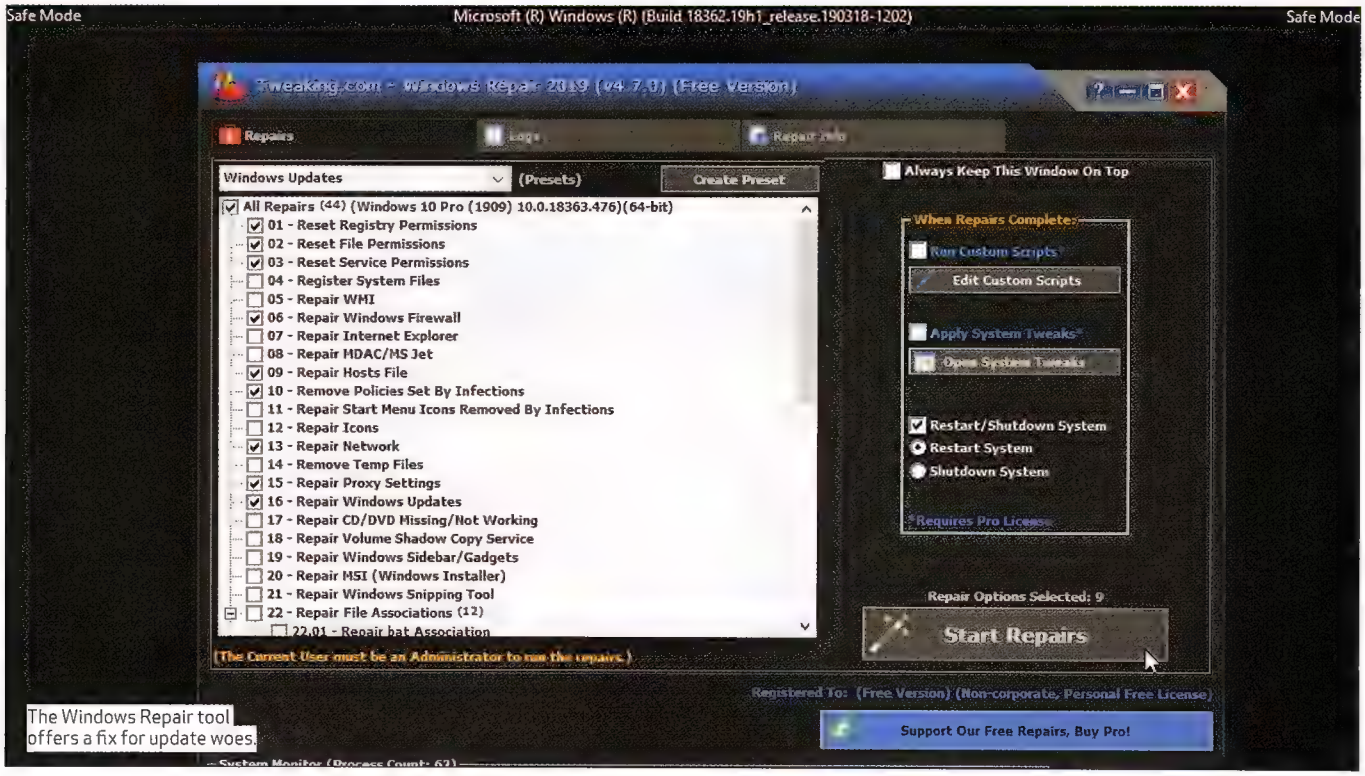
Once these general checks and repairs have been made, make Registry and System Restore backups when prompted, then click the 'Preset: Windows Updates' button to select all repairs related to Windows Update. Finally, click Start Repairs – once complete, your PC will reboot to Safe mode. Open msconfig again, but this time untick 'Safe boot' under the Boot tab before clicking OK and returning to Windows proper.

APPLICATIONS

QUICKEN STARTUP ERROR IN WINDOWS 10

After transferring my old Windows 7 setup to a new Windows 10 PC using Laplink PC

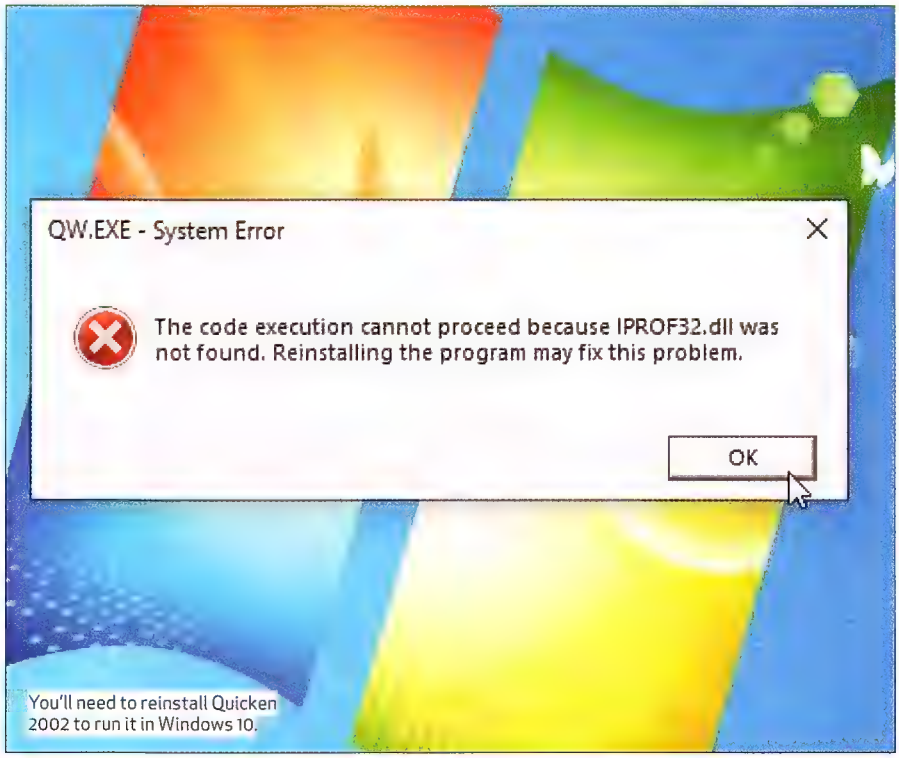
"Don't skip the System File Check – this is where you may come across corruption that needs repair."


Safe Mode
Microsoft (R) Windows (R) (Build 18362.19h1_release.190318-1202)
Safe Mode
Windows Updates
(Presets)
Create Preset
Always Keep This Window On Top
All Repairs (44) (Windows 10 Pro (1909) 10.0.18363.476)(64-bit)
01 - Reset Registry Permissions
02 - Reset File Permissions
03 - Reset Service Permissions
04 - Register System Files
05 - Repair WMI
06 - Repair Windows Firewall
07 - Repair Internet Explorer
08 - Repair MDAC/MS Jet
09 - Repair Hosts File
10 - Remove Policies Set By Infections
11 - Repair Start Menu Icons Removed By Infections
12 - Repair Icons
13 - Repair Network
14 - Remove Temp Files
15 - Repair Proxy Settings
16 - Repair Windows Updates
17 - Repair CD/DVD Missing/Not Working
18 - Repair Volume Shadow Copy Service
19 - Repair Windows Sidebar/Gadgets
20 - Repair MSI (Windows Installer)
21 - Repair Windows Snipping Tool
22 - Repair File Associations (12)
22.01 - Repair bat Association
When Repairs Complete:
Run Custom Scripts
Edit Custom Scripts
Apply System Tweaks*
Open System Tweaks
Restart/Shutdown System
Restart System
Shutdown System
* Requires Pro License
Repair Options Selected: 9
Start Repairs
(The Current User must be an Administrator to run the repairs.)
Registered To: (Free Version) (Non-corporate, Personal Free License)
Support Our Free Repairs, Buy Pro!
The Windows Repair tool offers a fix for update woes.

Mover I get the following error on bootup: 'BILLMIND.EXE – System Error. The code execution cannot proceed because IPROF32.DLL was not found. Reinstalling the program may fix this problem'.
Tom Hirons

BILLMIND.EXE is a startup program related to Quicken, which hasn't been updated in the UK since 2002. It should run in Windows 10 but isn't officially compatible. Laplink flags it as being potentially troublesome, but will still attempt to transfer it. You'll find the error occurs both at startup and when you try to launch Quicken itself.

Thankfully, the solution is simple: reinstall Quicken from its original CD. When prompted during setup, remove the version transferred across, along with any shared component files, then install a fresh copy, which should now work without compatibility settings.


QW.EXE - System Error
The code execution cannot proceed because IPROF32.dll was not found. Reinstalling the program may fix this problem.
OK
You'll need to reinstall Quicken 2002 to run it in Windows 10.

HARDWARE
PURPLE HAZE

My new 4K monitor was working perfectly, but after launching a full-screen virtual machine the display went a strange purple hue – even after I shut down the virtual machine. I was able to fix things with a reboot but am worried it might be a sign of possible physical failure.
Mandy Jones

> "My new 4K monitor was working perfectly, but after launching a full-screen virtual machine the display went a strange purple hue"

It may have been a one-off refresh problem, in which case you can safely ignore it – if it happens again, simply shut down and reboot everything. If the problem becomes more persistent, first check your monitor cable is plugged in snugly at both ends. Also check your PC is well ventilated and its cooling fans are doing their job – it may be linked to an overheating issue.

If you're convinced the problem isn't hardware-related, open your graphics adapter's Control Panel – such as Catalyst Control Centre (AMD) or Nvidia Control Panel – and look under the colour settings to verify they're correct. For example, CCC users should check the Pixel Format setting on the far-right tab, which should be set to RGB, while Nvidia users may have joy experimenting with the settings under 'Display > Adjust desktop colour settings'.

OFFICE
OFFICE 365 AND WINDOWS 7

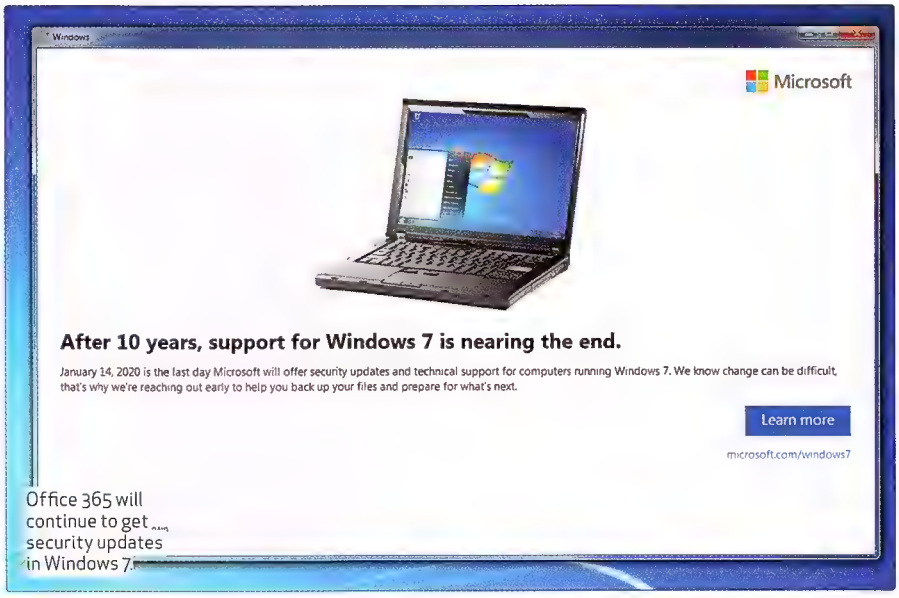
I've read that Office 365 is no longer supported on Windows 7 as of 14th January. Must I now upgrade to Windows 10 to continue using it?
Karen Chevalier

While we strongly recommend you upgrade to Windows 10 for a host of reasons, Microsoft has announced that it will continue to supply security updates to Office 365 for another three years. You won't get any feature updates, but Office itself will continue to be secure.

BACKUPS
CAN I TRUST MY BACKUP?

While I diligently back up, I've no idea that any of them work. How can I test they're all okay?
Phillip Levell

Neither of Windows' built-in backup tools – File History or the older Windows 7 Backup and Restore tool –


Microsoft
After 10 years, support for Windows 7 is nearing the end.
January 14, 2020 is the last day Microsoft will offer security updates and technical support for computers running Windows 7. We know change can be difficult, that's why we're reaching out early to help you back up your files and prepare for what's next.
Learn more
microsoft.com/windows7
Office 365 will continue to get security updates in Windows 7.

Quickfire questions

I wanted to give Moneywiz 3 a test drive, but having decided against upgrading from version 2 for now, can no longer use my SYNCbits account. Please help!
Isabel Rufus

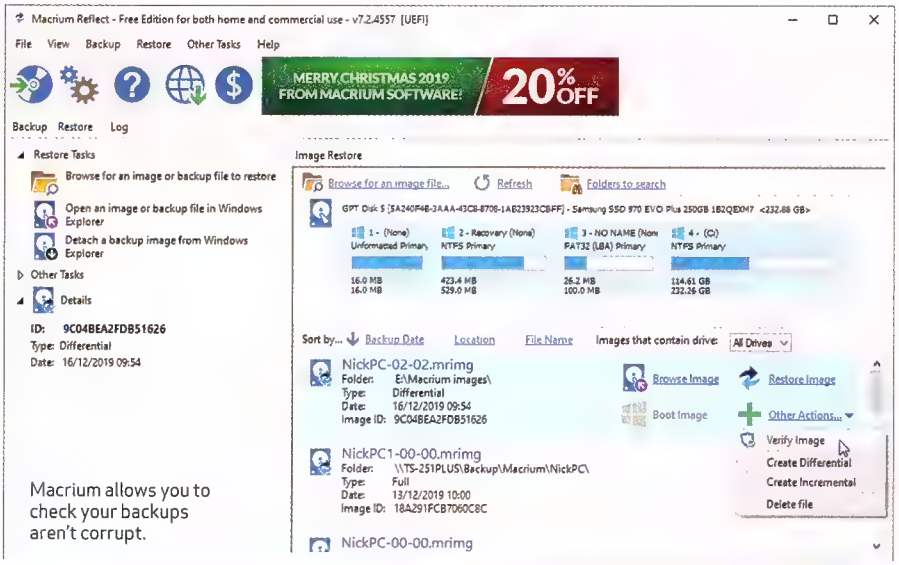
Go to **https://my.syncbits.com** and log in with your SYNCbits users name and password. Click the 'Revert SYNCbits to older version' button next to MoneyWiz to revert it back to version 2.

After updating my HP laptop to Windows 10 1909 my SD card reader keeps reverting back to letter E, even though I diligently change it.
Stephan Rousta

This is a bug that HP has corrected itself with a driver update – visit **https://support.hp**.com/ to enter your notebook model and download the latest updates, including the PCIe Media Card Reader drivers.

I recently added a second internal hard drive, but while it's visible in the BIOS, it's not appearing in Windows at all?
George Murco

Right-click the Start button and choose 'Disk Management' – locate your new drive (marked as 'unallocated'), right-click this and choose 'New Simple Volume' to start setting it up.



Macrium allows you to check your backups aren't corrupt.

"Neither of Windows' built-in backup tools – File History or the older Windows 7 Backup and Restore tool – have verification options"

have verification options, leaving you at the mercy of both. You'll only know if your data has been safely backed up when you try to restore it.

A better approach is to switch to third-party tools with built-in verification options. For example, Macrium Reflect Free users should switch to the Restore tab and click 'Other actions' next to a backup to select 'Verify image' to manually check it. You can also have backups verified when they're created by editing your backup definition file under 'Backup > Backup Definition Files'. Select 'Advanced Options > Auto Verify Image' to do so. Similarly, EaseUS Todo Backup Free (**www.easeus.com/backup-software/tb-free.html**) also allows you to check both file- and image-based backups for corruption – select 'Tools > Check Image' to manually check.

APPLICATIONS
TRANSCRIBE VIDEO EASILY

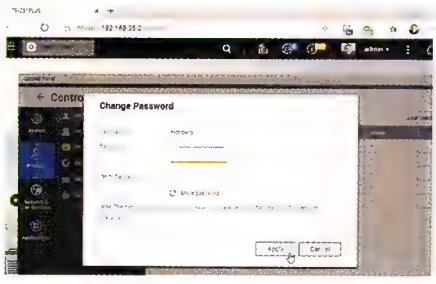
I have some old video interviews of a family member that I'd like to transcribe to text. Is there some way to automate this process? There's over 20 minutes of interview to capture.
Arthur Evans

You could invest hundreds of pounds in a program like Dragon Professional (**www.nuance.com**), but for one-off

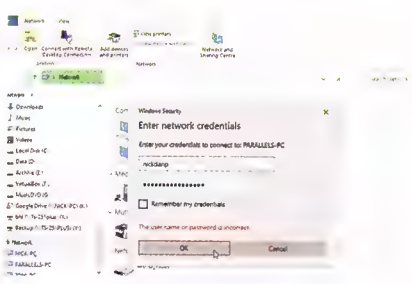
SECURITY
PROTECT NETWORK SHARES FROM RANSOMWARE ATTACK

I've heard it's possible for ransomware to access files on my NAS if it infects my PC. Can I prevent this, and how?
Iain Collingwood

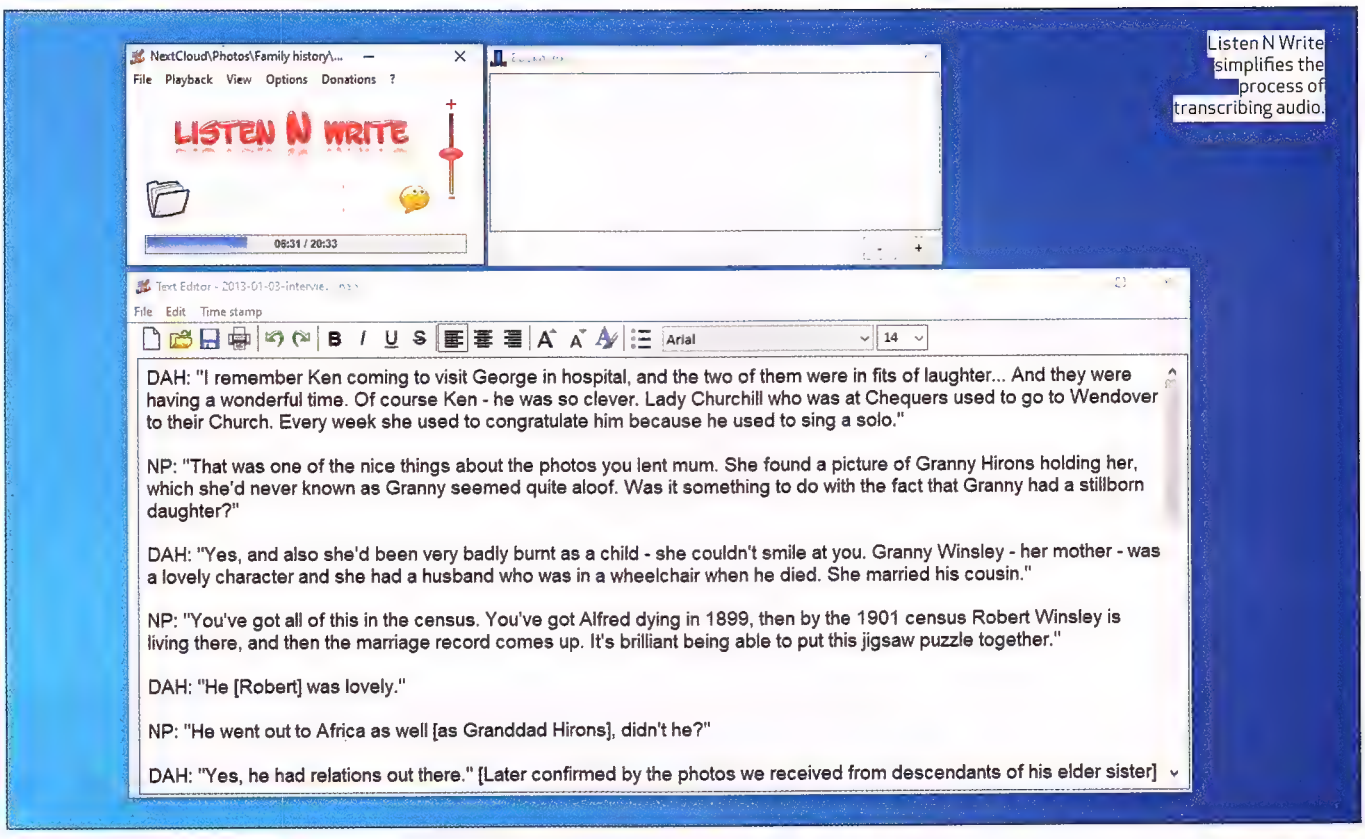
The best way to prevent ransomware from infecting any network shares is to make sure your network credentials aren't stored in Windows. This step-by-step guide shows you what you'll need to take to secure your NAS and its backups.



5 CHANGE SHARED CREDENTIALS
If you've set up a user on your NAS that shares the same username and password as your Windows account for ease of access, log into your NAS's user account settings and change the password to something unique.



6 NEVER SAVE CREDENTIALS
When you're next prompted to log on to access a network share, make sure the box 'Remember my credentials' is left unticked – this ensures that Windows doesn't store the password, giving ransomware a way in.


NextCloud\Photos\Family history\...
File Playback View Options Donations ?
LISTEN N WRITE
08:31 / 20:33
Text Editor - 2013-01-03-intervie...
File Edit Time stamp
Arial
14
DAH: "I remember Ken coming to visit George in hospital, and the two of them were in fits of laughter... And they were having a wonderful time. Of course Ken - he was so clever. Lady Churchill who was at Chequers used to go to Wendover to their Church. Every week she used to congratulate him because he used to sing a solo."
NP: "That was one of the nice things about the photos you lent mum. She found a picture of Granny Hirons holding her, which she'd never known as Granny seemed quite aloof. Was it something to do with the fact that Granny had a stillborn daughter?"
DAH: "Yes, and also she'd been very badly burnt as a child - she couldn't smile at you. Granny Winsley - her mother - was a lovely character and she had a husband who was in a wheelchair when he died. She married his cousin."
NP: "You've got all of this in the census. You've got Alfred dying in 1899, then by the 1901 census Robert Winsley is living there, and then the marriage record comes up. It's brilliant being able to put this jigsaw puzzle together."
DAH: "He [Robert] was lovely."
NP: "He went out to Africa as well [as Granddad Hirons], didn't he?"
DAH: "Yes, he had relations out there." [Later confirmed by the photos we received from descendants of his elder sister]
Listen N Write simplifies the process of transcribing audio.

transcriptions you're better served paying an online service like Sonix (**https://sonix.ai/**), which charges $10 for an hour of transcription. In either event, you'd still need to compare the transcription with the original recording to catch any errors.

Alternatively, if you're happy to transcribe it yourself, but want a bit of help, then use a free tool called Listen N Write (**https://sites.google.com/site/elefantsoftwarefreeware/listen-n-write-free**) which works with a wide range of video and audio files. Load in the file, then press F12 to launch the Smart Pause N Play dictation feature. Finally, type your transcription into the text editor window. The dictation feature pauses the playback every five seconds for a second or so to give you time to keep up. Manual playback controls can also be used, and you can alter both playback time and length of pause via the Options menu.

NETWORKING

NETWORKED PCS CAN'T CONNECT SIMULTANEOUSLY

I recently bought my wife a laptop, and she's fine using it until I switch on my desktop, at which point her connection drops. She then gets an on-screen prompt about IP address conflicts every few minutes and can't get back online until I shut down my PC. Please help! Andrew Goshawk

Ordinarily this would be a classic case of both computers being allocated the same IP address – typically when one is assigned a static IP address that's within the range of addresses allocated by your router's DHCP server. Yet on closer inspection, both PCs had different IP addresses, so this shouldn't have applied. It was at this point we discovered Andrew was using a very old piece of networking software – HomeNet Manager – as an additional layer of security. Andrew's PC was still running Windows 7 at this point – so we advised him to remove the program before upgrading to Windows 10.

As soon as the HomeNet Manager software had been uninstalled, his wife and he were both able to access the network simultaneously.

From now on, Andrew's chosen security software (Bitdefender) should provide adequate security for both PCs on his network; if he wants to occasionally check for possible intruders, log into your router's administration page to see a list of connected devices; if it doesn't support this feature, try a tool like Advanced IP Scanner (**www.advanced-ip-scanner.com**) instead. It's free to download.

4 REMOVE EXISTING CREDENTIALS
Type 'credentials' into the Search box and click 'Credential Manager'. You should see entries for each saved network password under 'Windows Credentials' – click the v button followed by Remove > Yes to clear it.

5 STORE CREDENTIALS ELSEWHERE
If you're accessing the network share through a third-party app – say your backup tool – you should be able to securely store your credentials in the app itself. In Macrium, select Other Tasks > Edit Defaults > Network tab to do so.

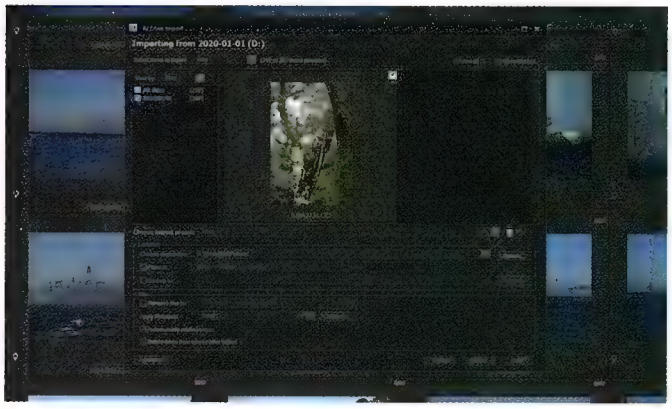
Get organised in Photo Studio

Never lose an image again with ACDSee Photo Studio Ultimate 2020's organisational tools – Ian Evenden shows how it's done.

Modern cameras can shoot at extremely high framerates, and storage cards are cheap. Putting these together means it's not unusual to return from holiday with a lot of photos to sort through, and as we're no longer in the habit of printing every image we capture only one or two exceptional shots from a trip will eventually be pulled out for use.

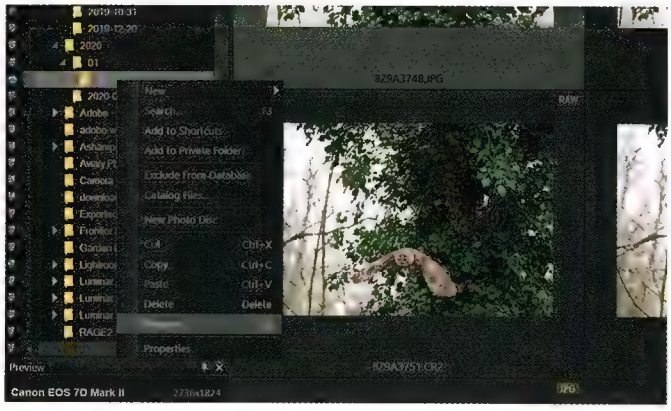
To get to this stage, you need to be organised. Having a hard drive full of image files can be enormously satisfying, right up until the point you need to find something. If your files are not organised, it can be a wearying task to trawl through folders looking for images. Here, we'll look at importing your files through ACDSee Photo Studio Ultimate, and using GPS data and keywords to find images easily. Get a free trial of ACDSee Photo Studio 2020 from **http://bit.ly/PSUtrial**

HOW TO Manage your photo collection



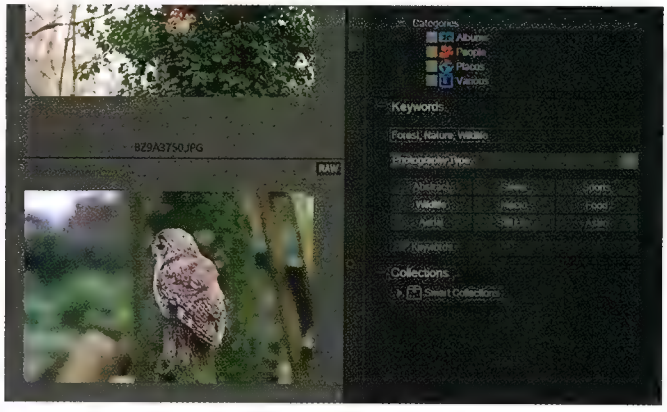
1 IMPORT

The first step toward becoming organised is to use the app to import your photos, rather than just copying them from a memory card. This way, you can use the import options to create folders with a consistent date-based naming structure, and even create a backup on an external drive at the same time. You can do this from an existing hard drive folder as well as a memory card.



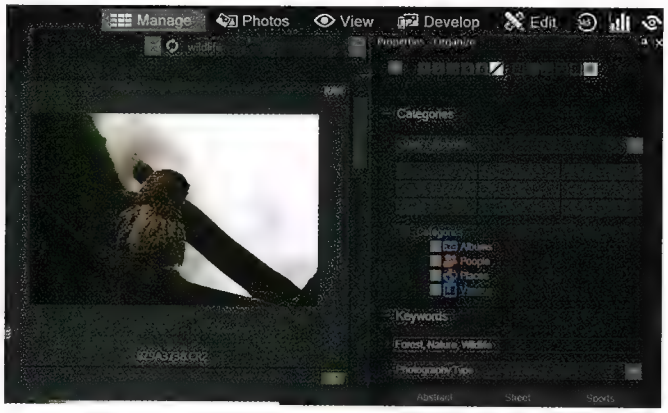
2 RENAME

By importing in this way, you made things easier to find by date. But can you remember where you were on a given day last year? We can't. By adding a few words to the folder name, you'll be able to pick out the day you shot steam trains from the day you spent on the beach with the grandkids. Just right-click a folder name on the left of the interface and choose 'rename'.



3 ADD KEYWORDS

Adding keywords to your images' metadata makes them easier to find. Click the folder you wish to keyword on the left, then use Ctrl-A to select every image in it. Move to the right-hand side of the Manage interface and click the Organize tab. In Keywords, above, there are pre-set suggestions, or type your own into the box, separated by a comma.



4 SEARCH BY KEYWORD

Get into the habit of keywording your images, and you'll be able to search your database of images for photos of owls, or of family, or motor racing, or whatever keywords you've decided to use. In Manage mode, the quick search box is at the top right. Search a keyword, then click an image and click the Organize tab to see which other words it's associated with.

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STEP-BY-STEP GUIDES
• PC: GET ORGANISED IN PHOTO STUDIO
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• LINUX: THE SMARTER WAY TO DELETE FILES
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5 QUICK SEARCH

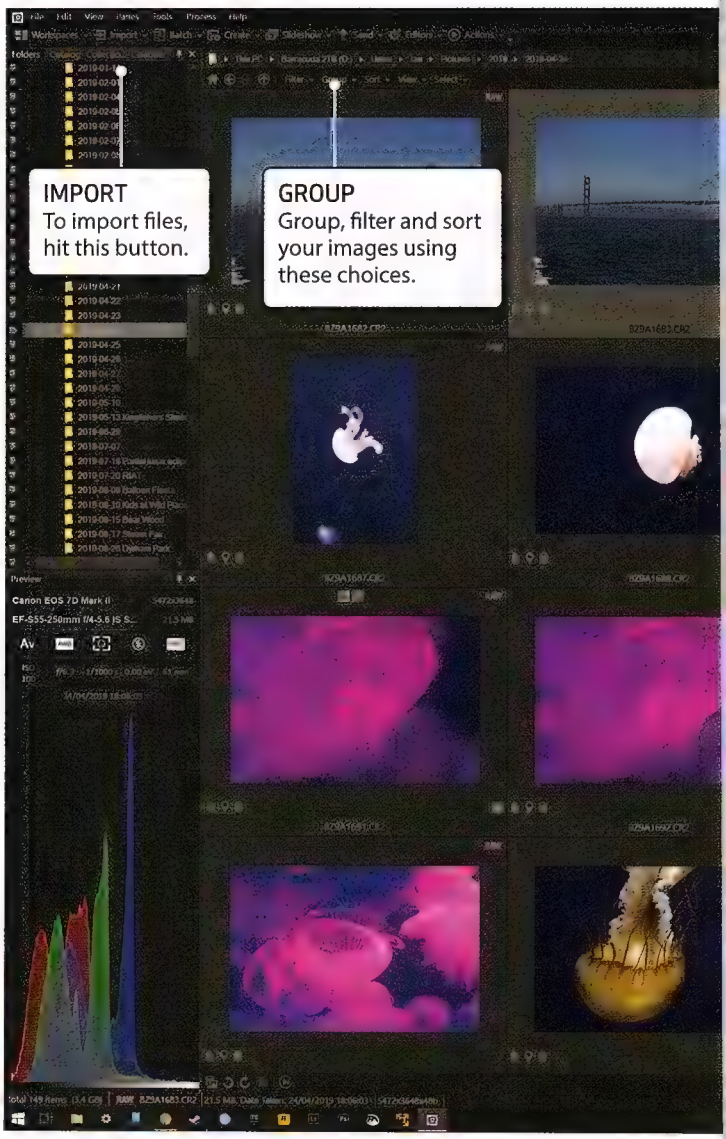
Drop down the menu button next to the Quick Search box in Manage mode and you'll get a set of options. You can choose what is searched, including filenames (useful if you have multiple cameras that save files with recognisable names), folder names (useful if you've followed Step Two, above) and faces. Image metadata, which includes Keywords, is always searched.

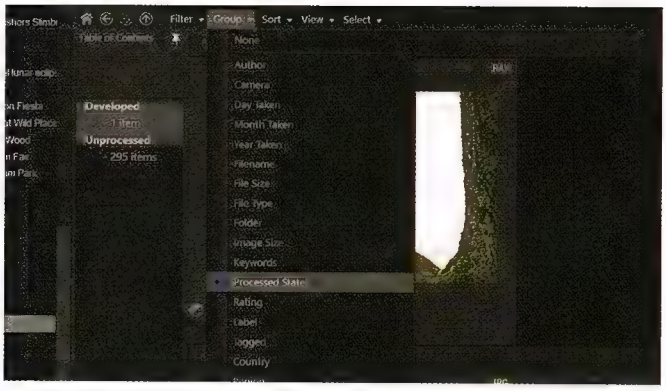
6 GPS DATA

Click on the map pin icon at the bottom left of the grey surround of an image thumbnail in Manage mode, and you'll be taken to a map view (if your camera embeds GPS information into the metadata, that is). This shows you how many of your images were taken in specific places. Zoom in, and you'll be able to follow your path as you walked around and took pictures.

7 MAP NAVIGATION

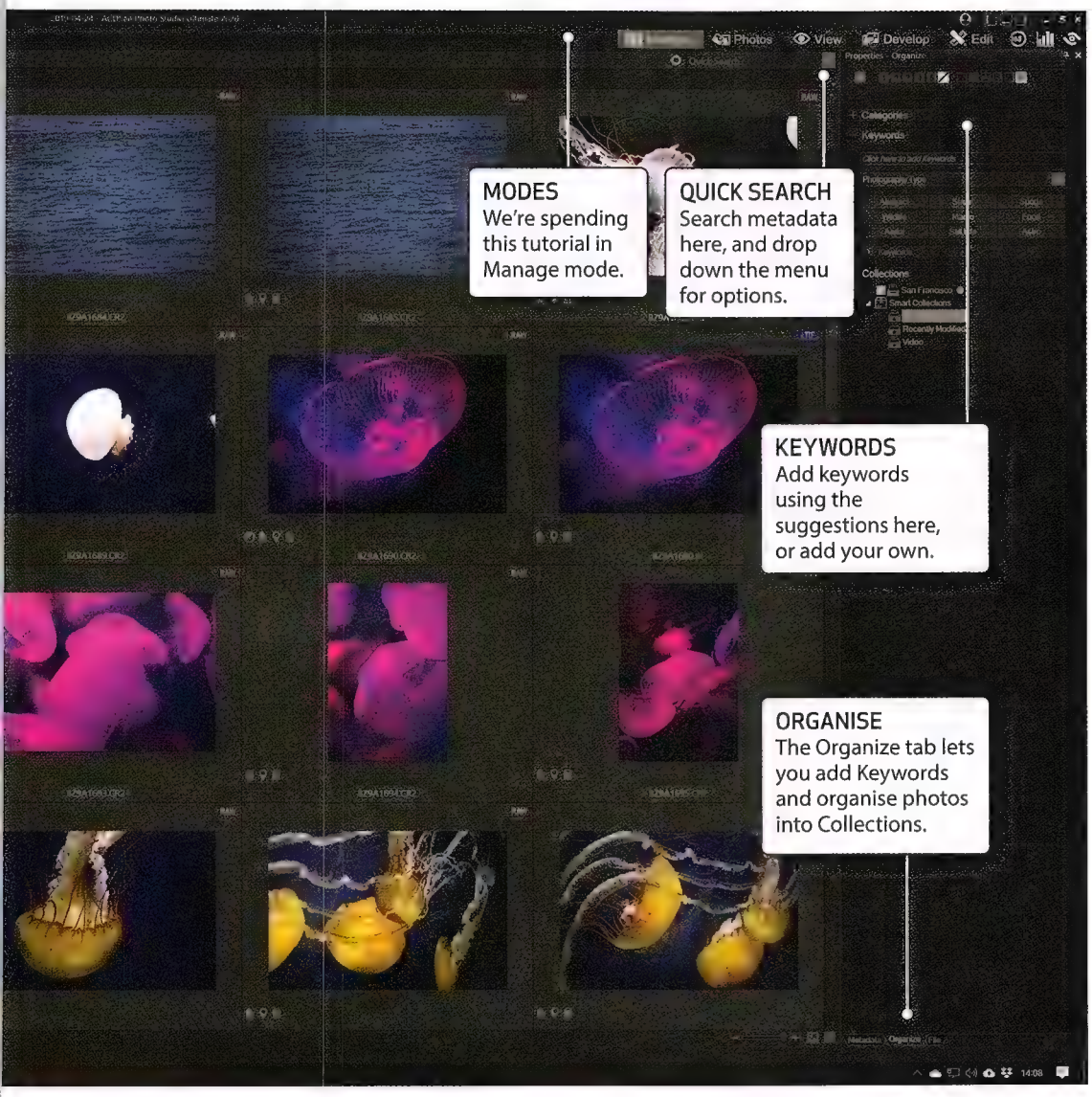
Each pin on the map is marked with a number, showing you how many images are associated with that spot. Red pins are individual locations, while blue ones are combined locations created because you're not zoomed in far enough. Click on a pin so it turns yellow, and the thumbnails at the bottom of the screen update to show the images taken in that area.





8 GROUPING

Toward the top left of the Manage window are menus that allow you to change how your images are displayed. You can sort them by rating, if you've rated them, but the one we find most useful is Group, and its Processed State setting. This sorts your folder into images that are untouched, those that have been developed, and those that have been edited.


MODES
We're spending this tutorial in Manage mode.
QUICK SEARCH
Search metadata here, and drop down the menu for options.
KEYWORDS
Add keywords using the suggestions here, or add your own.
ORGANISE
The Organize tab lets you add Keywords and organise photos into Collections.

JARGON BUSTER!

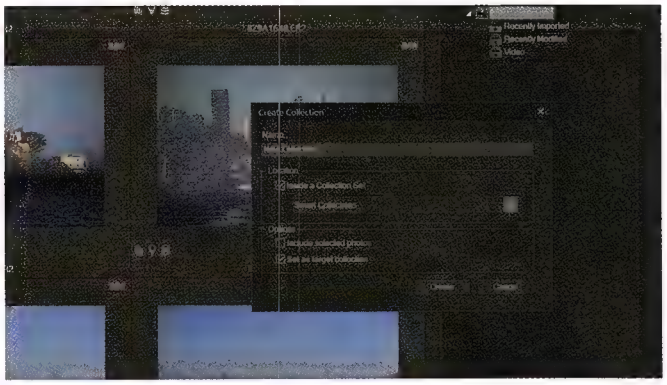
CATALOGUE
ACDSee, in common with other image management apps, keeps a database of image data, non-destructive edits, etc.

METADATA
Data about data. Your camera saves a lot of information on each photo it takes, which you can add to.

KEYWORDS
Words associated with your images, designed to be searched for.

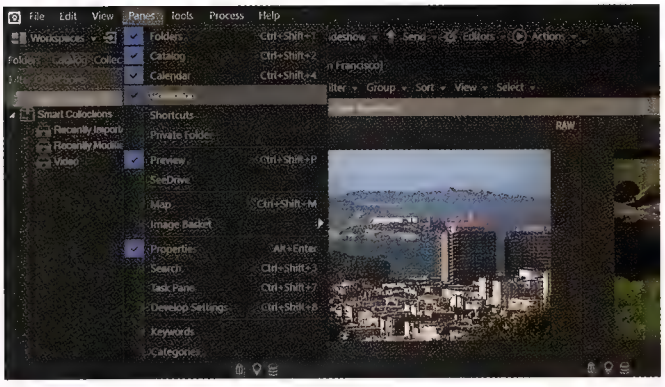
IAN'S BEST TIP!

Back up your catalogue regularly. If anything goes wrong, you'll mourn its loss. The app will prompt you.



9 COLLECTIONS

If you've got photos that were taken over the course of several days, you can group their folders into a Collection. Open the Organize tab, then click the '+' by Collections if you need to. Right-click on one of the existing Smart Collections, and choose Create Collection. Give it a name, and you can add images to it by selecting them and ticking the box by the Collection's name.



10 SMART COLLECTIONS

It's not open by default, but by going to the Panes menu and ticking the Collections box, you open a new tab on the left which shows your Collections as if they were folders. Smart Collections automatically gather together things like recently imported or modified photos for you to view, and you can move them directly from here into Develop or Edit mode.

Creative compositing

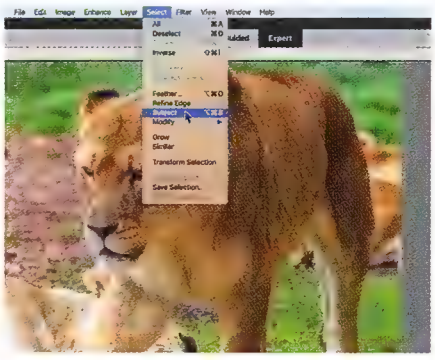
Master selection tools and layers for creating photographic illusions. With George Cairns.

By selecting a subject from one photo and adding it to another you can have fun producing creative composite images.

In this walkthrough, we'll replace a dog with a lioness to demonstrate the process of selecting a complex object. Photoshop Elements 2020 boasts new tools that are designed to speed up selections, such as the one-click Select Subject command. However most of these quick selections will need some refining to cleanly isolate a subject from their background. Fortunately, the Refine Edge command has all the tools you need to create a clean selection.

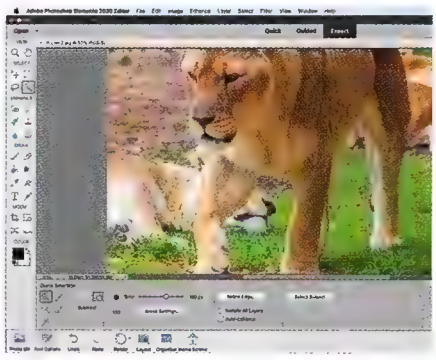
We'll also show you how to transform the size of the selected object so that it fits into the new scene. To complete the illusion, we'll add a shadow to our composited lioness to help anchor her into her new surroundings. You can apply our selection, transforming and grading techniques to your own source images and have fun producing your own creative composite scenes.

HOW TO Create a natural-looking composite image



7 MAKE A SELECTION

Open the image containing a subject that you want to select. Choose Select > Subject. Photoshop will attempt to draw a selection marquee around the main subject. In this case it has also included some of the background lioness.



8 FINE-TUNE THE SELECTION

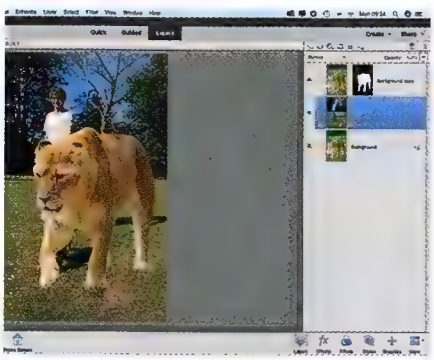
In the Tools panel Select section, click the bottom right tool. In the Options bar, choose the Quick Selection tool. Click the Subtract From Selection icon (grey on white rectangle). Spray over unwanted objects to remove them.

9 REFINE THE EDGE

In the Options bar, click Refine Edge. Set View to On Black. Tick the Smart Radius box and increase the slider to 2.1px. Tick the Smart Radius brush icon. Spray around the edge of the subject to reveal missing details.

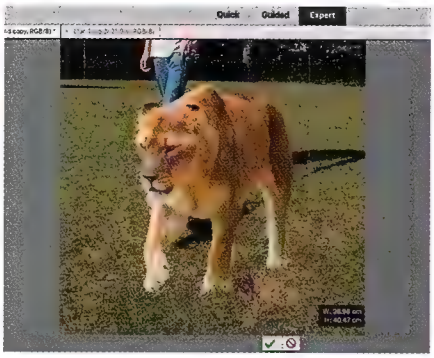
3 COMPLETE THE SELECTION

You may find bits of background clinging to the edge, especially between delicate details such as hairs. Increase Contrast to 27. Add a Feather of 0.9 to soften the edge. Set Output to New Layer with Layer Mask. Click OK.



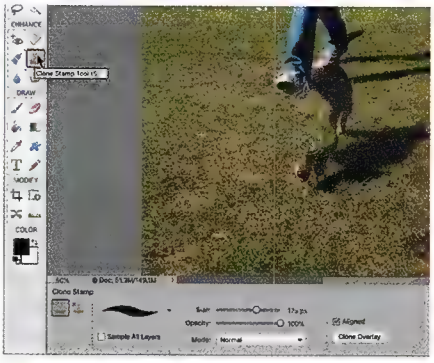
4 ADD NEW BACKGROUND

You'll see a new layer with a black and white mask. Open the background photo. Choose Edit > Select All and then Edit > Copy. Go to the Lioness document and choose Edit > Paste. Drag the new background below the lioness.



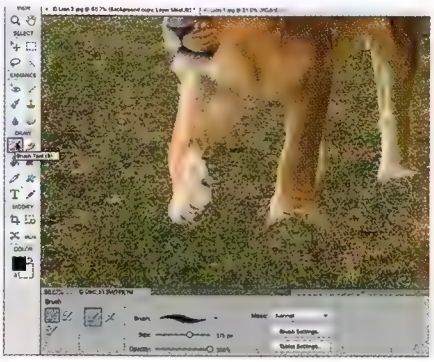
5 TRANSFORM THE SUBJECT

Our lioness is too large. Click on that layer and choose Image > Transform > Free Transform. In the Options bar, tick Constrain Proportions. Drag the Transform box's corner handles to scale the lioness down. Click the green tick.



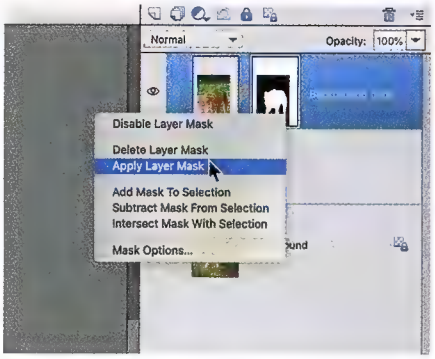
6 REMOVE THE DOG

Click the lioness layer's eye-shaped icon to hide it. Click on the background layer containing the dog. Grab the Clone Stamp tool. Hold down the option key and click to sample some grass. Spray the grass over the dog.



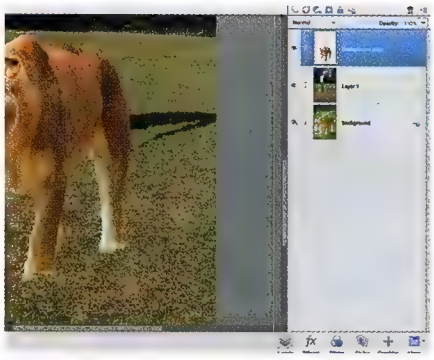
7 MODIFY THE MASK

Make the lioness's layer visible. Click on that layer's mask to target it. Grab the Brush tool from the Tools panel. Set the Foreground colour to black. Spray over the paws to make them blend with more grass on the background layer.



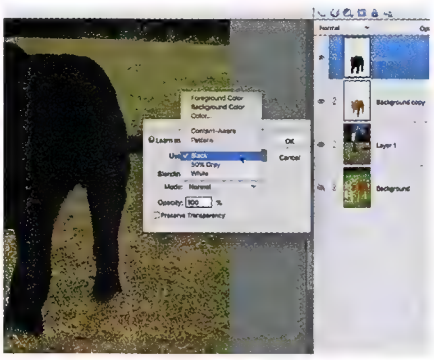
8 APPLY THE MASK

Spray a black brush on the mask to hide any more unwanted background from the lioness's original photo. Use a white brush to reveal missing details from the lioness's edge. Right click on the mask and choose Apply Layer Mask.



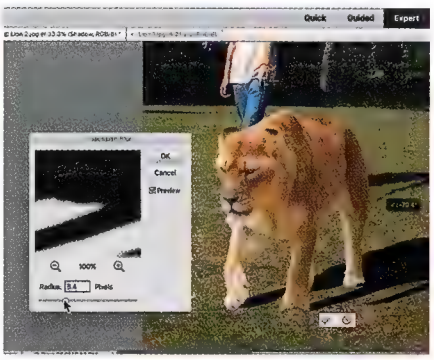
9 SELECT THE SUBJECT

The layer mask will vanish, leaving the lioness against a transparent background. Hold down the command key and click on the lioness layer's thumbnail. This keyboard shortcut selects the lioness's shape with a marquee.



10 FILL WITH BLACK

Choose Layer > New > Layer. Click OK. Click on the new layer. The marquee will still be visible. Choose Edit > Fill Selection. In the Fill Layer box, choose Black from the Use menu. Click OK. Press command-D to deselect the marquee.



11 TRANSFORM THE SHADOW

Drag the shadow layer below the lioness. Choose Image > Transform > Free Transform. Hold command and drag the corner handles to distort the shadow. Click the green tick. Choose Filter > Blur > Gaussian blur to soften the shadow's edges.

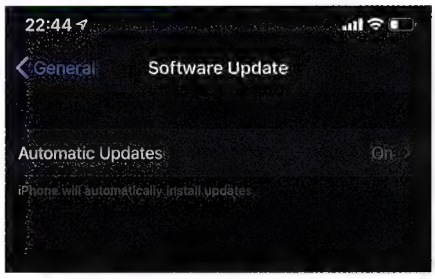
Control music and TV apps

Kenny Hemphill uses the Remote app to make music and TV playback on Mac a cinch.

Apple's media tools have had something of an overhaul in recent years, and the dumping of iTunes from the Mac and its replacement with Music, Podcasts, and TV seemed to be the final piece in the puzzle. But there was one last piece to fit, the apparently forgotten and often maligned Remote iOS app. Now over 10 years old, the Remote app once let you control iTunes playback on your Mac or an iTunes server on your network, or even on an Apple TV. It seemed to be on its way out along with iTunes. But an update to macOS and iOS in December breathed new life into it, and gave it the ability to control both the Music and TV apps in macOS Catalina.

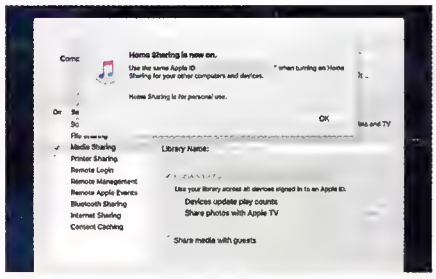
You can navigate playlists, cue up tracks, and play, pause and skip songs. Your Music Library appears in the app and, if you have it open on your Mac, so does TV. You can also use it to control AppleTV+ streaming content, but you will have to initiate playback from your Mac first.

HOW TO Master the Remote app



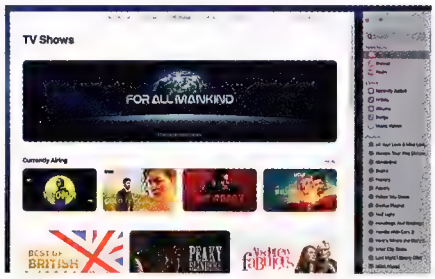
1 MACOS AND IOS

On your Mac, click the Apple menu, choose About this Mac, then Software Update and follow the instructions to update your Mac. On iOS or iPadOS, open the Settings app, tap General, then Software Update.



2 HOME SHARING

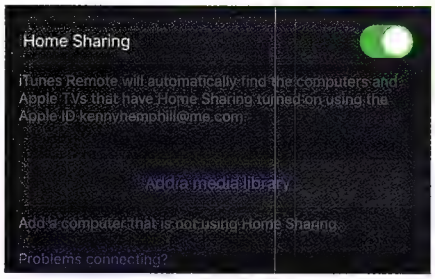
On the Mac, go to System Preferences and click on the Sharing tab. Check the box next to Media Sharing, then Home Sharing. Choose from the options on that screen and then quit System Preferences.



3 LAUNCH MUSIC OR TV

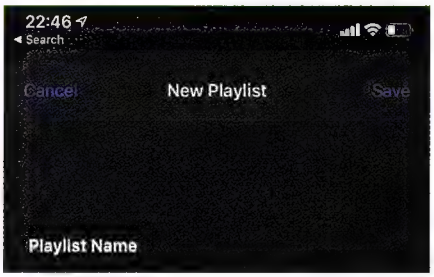
The Music app must be running in order for Remote to see it. Likewise the TV app, if you want to control that. Go to the Dock and click on Music, and, if you want to use it, TV. Once running, tap the Remote app on your iPhone or iPad.

"You can navigate playlists, cue up tracks, and play, pause and skip songs. Your Music Library appears in the app and, if you have it open on your Mac, so does TV."


Home Sharing
iTunes Remote will automatically find the computers and Apple TVs that have Home Sharing turned on using the Apple ID kennythemphill@me.com
Add a media library
Add a computer that is not using Home Sharing
Problems connecting?

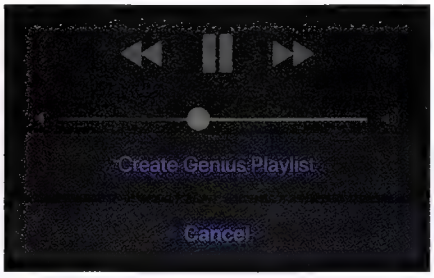
1 ADD MEDIA LIBRARY
You should see your Music and/or TV library in the app as you open it. If not, tap Settings, then Add Media Library. Select your iOS device in the sidebar and type in the code shown on the screen of the device to allow it to control the app.

2 PLAY A TRACK
Tap the Music library on the Remote app screen. You'll see Playlists. Choose a playlist, or tap Artists or Albums to see those views. To search for a track, tap Search. Once you've found the track you want, tap it and press Play.

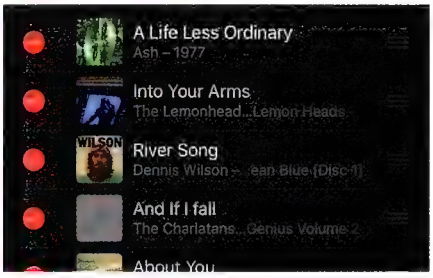


3 CREATE A PLAYLIST
In Playlists in the Remote app on your device, tap New. Type a name for the Playlist. Tap Save. Use Search to locate tracks or browse Playlist, Artist or Album. Tap a track to add it. Continue adding tracks. It will save automatically.

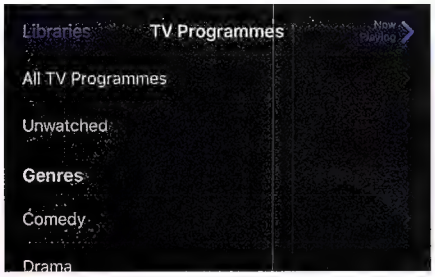
1 EDIT A PLAYLIST
Choose the playlist you want to edit from the Playlists view. Tap it, then tap the More icon above. Choose Edit. Tap the red minus circle to remove a track, or tap and hold on the three lines to drag a track to a different position. Tap Done.



2 GENIUS PLAYLIST
Find the track you want to base the Genius playlist on and tap it so that you see the play controls. Tap the More icon (bottom right) and choose Create Genius Playlist. Remote will create a playlist inspired by and named after the track.



3 UP NEXT
While a track is playing, tap Up Next to see the list of cued songs. Tap Edit to delete songs or change their order. Press the Shuffle icon to jumble them up, or tap Add then locate a track to add it as the next song to play.



1 SWITCH TO TV
To return to the first screen, tap Libraries. Now tap the Library with an Apple TV icon to switch to controlling the TV app. You'll see the icons on the bottom of the screen change to reflect this. Tap Films or TV Programmes.

2 FIND SOMETHING
Films and TV programmes are sorted into categories and genres. Tap on one to see content and scroll through the programmes or films to find one. Alternatively, tap the magnifying glass to search for a movie or TV show.

3 APPLETV+
You'll need a subscription for this. Locate the programme you want to watch in the TV app on your Mac and press Play. In the Remote app, tap Now Playing and you'll see it. Use the buttons to control it. ■

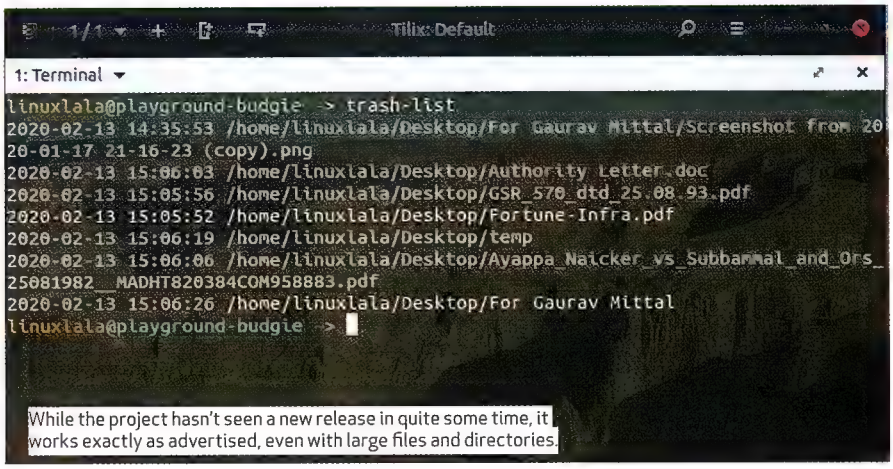
The smarter way to delete files

If you're worried about accidentally wiping out important files, Shashank Sharma knows of a few techniques to protect yourself.

Deleting files is a fairly straightforward process, whether you work with a graphical interface or the command line. The former, more often than not, relegates deleted files into the trash directory, giving you the option to access deleted files and even restore them if needed. But this isn't the case with the popular `rm` command. Once invoked, `rm` immediately flushes the specified files, skipping the trash directory altogether. To recover a file deleted from the command line, you must use dedicated software such as PhotoRec, but the process is involved and cumbersome, and not the subject of this tutorial.

If you wish to permanently delete files using the graphical environment, you must press the Shift-Del key combo. You'll be prompted with an alert seeking confirmation before the selected files or directories are deleted. This is in stark contrast to the command line, where running the `rm` command will delete the specified files without any confirmation prompts.

In this tutorial, we'll discuss two command-line utilities, `trash-cli` and `rm-protection`, which you can use to add these functionalities to the terminal.



While the project hasn't seen a new release in quite some time, it works exactly as advertised, even with large files and directories.

TRASH FOR BASH

Even if your graphical environment of choice doesn't place an icon for it on the desktop, your Linux distro already has a trash directory. The advantage of relegating files to a trash directory is that it gives you the option to view all the deleted files and even restore files, empty the trash, etc. You can access this trash directory by navigating to ~/.local/share/trash. It comprises three directories: files, expunged and info. The info directory keeps a record of the permissions, path and deletion date of each of the files. This is relevant and useful if you decide to restore deleted files or directories. You'll find all the deleted files and folders in the files directory.

The trash-cli utility adds the ability to move files to the trash from the command line. You'll find the utility in the software repositories of many popular desktop distributions. If it's not available for your distribution, you can follow these steps to install it from Git:

```
$ git clone https://github.com/andreafrancia/trash-cli.git
$ cd trash-cli
$ sudo python setup.py install
```

The first command creates a directory named trash-cli in the working directory and copies the contents of the trash-cli repository. You can now run the setup.py script to install the utility. You can optionally use the --user <username> command option with the last command so that the trash-cli utility isn't installed system-wide and is only available for the specified user:

```
$ sudo python setup.py install --user linuxlala
```

Once installed, the trash-cli utility provides five unique commands that can be used to delete files or

Make files immune to deletions

If you have accidentally lost precious data because of hasty Shift+Del, we have a quick solution to prevent further mishaps. You can use `chattr` to change the associated attributes for a file. The default syntax is `chattr [operator] [switch] [filename] .`

Refer to the man page of `chattr` for a list of all available attributes and their purpose. For now, we're only interested in the immutable attribute, which can be used to make sure a file cannot be deleted by any command, even by a root user.

Run the `sudo chattr +i filename` command to set the immutable attribute. You'll find that you can no longer delete the file, and you can't edit it either. Run `lsattr filename` to view the attributes of the specified file. `sudo chattr -R +i <directoryname>` can also be used to recursively change the attribute of all files in the specified directory.

If you wish to be able to edit the file, but only wish to protect it from being deleted, you can use the append attribute instead of immutable: `sudo chattr +a filename .`

Replace the + with an - operator to remove the attribute from a file. For instance, running the `sudo chattr -i filename` command will once again grant you the ability to edit or delete the file.

Quick tip

Instead of repeatedly invoking the trash-put command, you can instead create a shorter alias for the same. The trash-cli utility already provides trash as an alias to trash-put, so you can run the trash <filename> command to delete the specified file.

directories, view the contents of the trash, restore files and more:

```
trash-put - Delete specified files or directories.
trash-list - Displays the contents of the trash.
trash-rm - Delete individual files or directories from the trash.
trash-empty - Delete all files and directories from trash.
restore-trash - Restore the specified file or directory.
```

To delete a file, you must use the `trash-put` command. You can provide a list of space-separated files, and even use pattern-matching to specify the files you wish to delete. Unlike the rm command, which won't delete non-empty directories unless you use the -R command option, trash-put has no such reservations about deleting them.

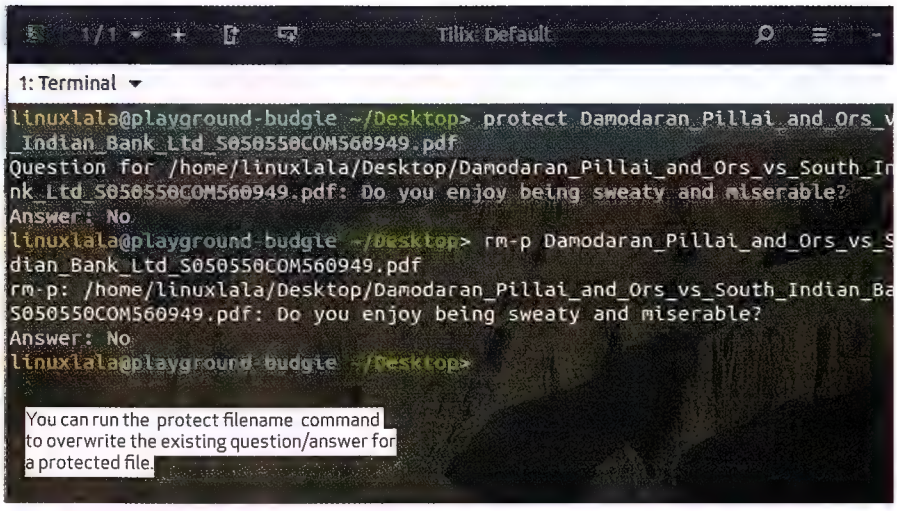
As the trash-cli utility only makes use of the already present /trash directory on your system, you can straight away run the trash-list command to view the contents of your /trash directory. That is, files deleted using the graphical environment, or from the command line using trash-put command can be accessed with the trash-list command.

When you run the `restore-trash` command without any additional arguments, the utility will display all the files in the /trash directory and ask you to choose the file you wish to restore. The files are all assigned a unique number, and you must enter the one corresponding to the file you wish to restore. The downside to this approach is that you can't simultaneously restore multiple files.

The `restore-trash` command also keeps track of your current working directory. If you invoke it from your /home directory, it will list all the files in the /trash directory. However, if you run it from another directory, it will only list the files in the /trash that were originally stored in that directory:

```
$ cd ~/Music/
$ restore-trash
No files trashed from current dir ('/home/linuxlala/Music')
$ cd ~/Documents/for-gm
$ restore-trash
 0 2020-02-13 14:02:31 /home/linuxlala/Documents/for-gm/memo of appearance.odt
 1 2020-02-13 14:02:34 /home/linuxlala/Documents/for-gm/temp
What file to restore [0..1]:
```

So the second time we run restore-trash , the utility presents a list of files deleted from the current directory, and asks you to specify the file you wish to restore.


Tilix: Default
1: Terminal
linuxlala@playground-budgie ~/Desktop> protect Damodaran_Pillai_and_Ors_v
_Indian_Bank_Ltd_S050550COM560949.pdf
Question for /home/linuxlala/Desktop/Damodaran_Pillai_and_Ors_vs_South_In
nk_Ltd_S050550COM560949.pdf: Do you enjoy being sweaty and miserable?
Answer: No
linuxlala@playground-budgie ~/Desktop> rm-p Damodaran_Pillai_and_Ors_vs_S
dian_Bank_Ltd_S050550COM560949.pdf
rm-p: /home/linuxlala/Desktop/Damodaran_Pillai_and_Ors_vs_South_Indian_Ba
S050550COM560949.pdf: Do you enjoy being sweaty and miserable?
Answer: No
linuxlala@playground-budgie ~/Desktop>
You can run the protect filename command to overwrite the existing question/answer for a protected file.

> "If you wish to permanently delete files using the graphical environment, you must press the Shift-Del key combo."

PRUNING TRASH

You can delete files or directories from the /trash with the `trash-rm <pattern>` or the `trash-rm <filename>` command. The latter command expects the complete name of the file, and you can't employ tab-complete with this command. So if you wish to delete a file named memo of appearance from the /trash, you will have to type the complete file name. If you only provide one part of the name to `trash-rm` it won't delete the corresponding file, nor will it report any errors. Alternatively, you can run the `trash-rm memo*` command to delete the file and all other files that start with the word memo.

The trash-empty command can similarly be used to delete all the files and directories from trash. The `<days>` command option can be used to only delete files that have been in the trash for longer than a specified number of days. For instance, if you wish to delete all the files that were deleted more than a month ago, you can run the trash-empty 30 command. The command `trash-empty 1` will similarly delete files that have been in `/trash` for longer than a day.

PROTECTED FILES

You can use the rm-protection utility to provide a question/answer for important files. The specified file will not be deleted unless you provide the correct answer to the prompted question. This ensures that files aren't deleted accidentally.

Run the `sudo pip install rm-protection` command to install the utility. It provides two commands - `protect` and `rm-p`. The former is used to specify the files you wish to safeguard against accidental deletions, while the latter can be used to delete files so protected. Remember, you can still delete a protected file using the rm or the `trash-put` command.

So if you decide to employ protect to safeguard your files, you should consider creating an alias for rm-p such as: `alias rm="rm-p"`

When you protect a file, the question and answer are stored in a plain text file named .filename.rm-protection. The answers are case-sensitive, so typing "terminator" as an answer in place of "Terminator" will result in an error.

If you're comforted with the possibility of restoring deleted files, we must take a moment to caution you against using the `rm-p` command. Like `rm` , it bypasses the /trash directory. ■

The network-locked Alcatel U3 recently sold for just $19.

Telstra's rebadged ZTE Blade A3-2019 sells for as little as $44.50.

The last-gen Nokia 2.2 sold at Coles supermarkets for $89.

The other sub-$50 single-board computers

Raspberry Pi is not the only low-cost single-board computer capable of running Android. Darren Yates explains the benefits (and drawbacks) of the alternatives.

Despite phone makers seemingly fast running out of people who haven't yet bought a mobile phone, 2019 was still a decent year for them, with market heavyweights Apple and Samsung leading the way. However, according to market analyst firm Omdia, the largest-selling Android phone for the year wasn't the Galaxy S10, or the Google Pixel 4 XL nor was it officially sold in Australia. It was the budget-friendly Galaxy A10. Now this is a phone that sits under the Galaxy A20 that sells in local supermarkets for around $180 (and which came fifth in 2019 sales charts). However, it shows that while many of us look longingly at folding screens with three-digit refresh rates or SoCs with laptop-busting performance, we buy what keeps the bank manager (or significant other) happy. In fact, budget phones can offer a lot of fun, provided you manage the risks.

QUAD-CORE COMPUTER FOR $19

There's no taking away from the Raspberry Pi how it has rewritten the textbook on 'low-cost computing'. I wrote a cover feature about it back in the September 2012 issue of *APC*. But the rapid proliferation and commoditisation of mobile tech has created plenty of similarly-priced alternatives – some closer to home than you'd think.

My first Android phone was an HTC Desire, purchased on a $49 monthly two-year plan in 2010. At the time, the Desire, with its fast 1GHz single-core CPU and massive 3.7-inch screen, sold at retail for around $800. Ten years later, my local supermarket recently advertised a Boost Mobile-locked Alcatel U3, with a basic 1.3GHz quad-core SoC and tiny four-inch screen for the princely sum of $19. I didn't buy it, as I'd already bought Boost's previous budget model, the rebadged ZTE Blade B112, for just $14.50. Pushing the budget a little more, we found the 2019 ZTE Blade A3 selling as the 'Telstra Essential Smart 2' for as little as $44.50, and the last-generation Nokia 2.2 as a locked prepaid option for only $89.

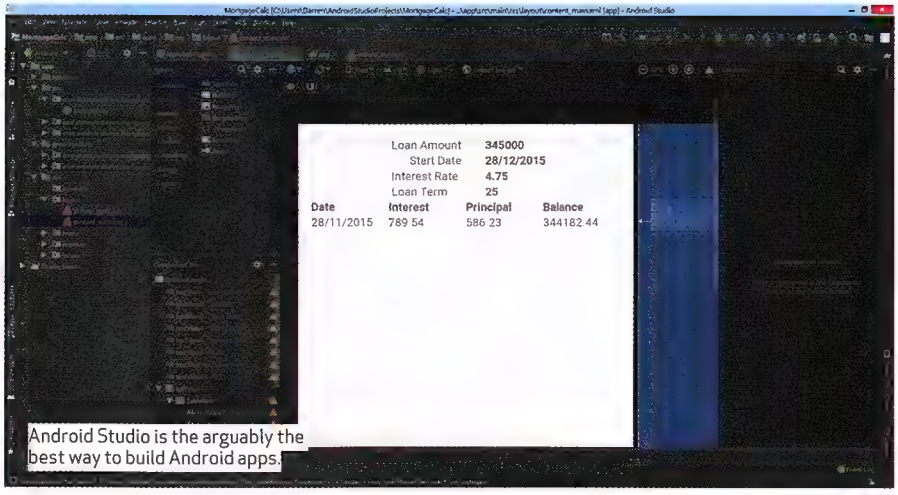
WHAT'S YOUR POINT?

My point is this – sure, these are cheap phones and, shock of shocks, they're not as good as a Galaxy S20. But see them for what they are – incredibly low-cost portable battery-powered computers with loads of wireless connectivity and enough processing speed for some really interesting applications – and things actually start looking up.

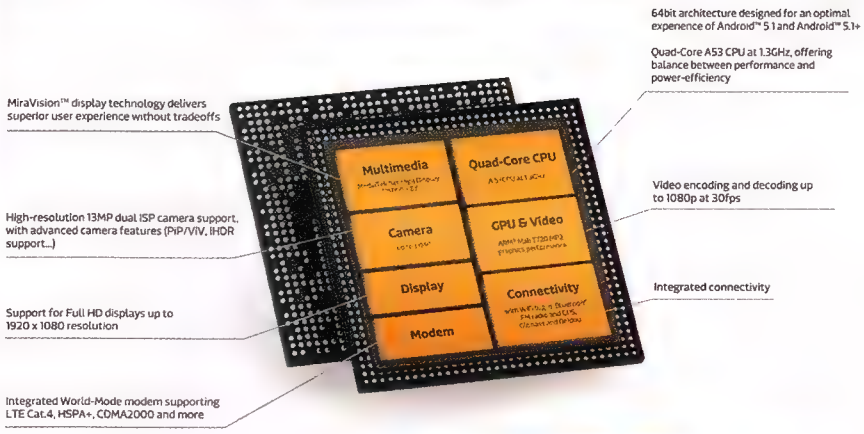
You can't buy a Raspberry Pi greater than 'Zero' in Australia for under $50 – and to which, you still have to add keyboard, mouse, screen, power, storage and OS. However, you can buy a prepaid Android phone that comes with most of this built-in.

Now I'm not suggesting a prepaid

This prepaid ZTE Blade B112 cost me just $14.50 from Coles.



Android Studio is the arguably the best way to build Android apps.


64bit architecture designed for an optimal experience of Android™ 5.1 and Android™ 5.1+
Quad-Core A53 CPU at 1.3GHz, offering balance between performance and power-efficiency
MiraVision™ display technology delivers superior user experience without tradeoffs
Video encoding and decoding up to 1080p at 30fps
High-resolution 13MP dual ISP camera support, with advanced camera features (PiP/ViV, IHDR support...)
Integrated connectivity
Support for Full HD displays up to 1920 x 1080 resolution
Integrated World-Mode modem supporting LTE Cat.4, HSPA+, CDMA2000 and more
Multimedia
Quad-Core CPU
Camera
GPU & Video
Display
Connectivity
Modem

The MT6735 is one of the Mediatek chips affected by a new security flaw.

MEDIATEK MT6735 PROCESSOR

phone can replace a Raspberry Pi outright – but I am suggesting they can be an alternative. As for the idea of 'on-going costs' with phone network charges, really, what charges? Keep the SIM card in the box and you've got a cheap portable computer. You can't run a phone on USB power without a battery installed, but you can happily run a phone without a SIM card in place.

THE DRAWBACKS

To be fair, though, living with budget phones isn't necessarily a life of beer and skittles. In fact, if you intend to use one as your daily driver, you need to choose extremely carefully – and it's not just about whether or not the screen is bright enough outdoors.

The one major problem Android hasn't really progressed far on in the last five years is security updates. My 2017 Motorola Moto G5 is still a decent functional phone, but it hasn't seen a security update since February 2019 – and most likely won't. But these updates aren't just important for the Android OS – they may also be needed to rescue your phone's hardware and if you own a phone with a MediaTek chip, keep reading.

MEDIATEK ROOTKIT FLAW

MediaTek doesn't have the same profile in phone chip design as ARM or Qualcomm, but it produces a sizeable chunk of the chips that go into budget and mid-range phones and tablets, as well as some Android TVs. So news that a rootkit-style security flaw has been lurking around in a number of MediaTek's chips since April 2019 has been greeted with alarm – and this is where Android's security update problem rises to the surface.

Android phones are an uneasy alliance between four key players – the phone maker, the phone's chip maker, the phone network service provider and Android itself. Google produces security updates every month, but it requires at least the phone maker to certify that the update doesn't send their phone pear-shaped. If the phone is locked to a network provider, that provider usually has to give it the once-over as well. While mid-range phones generally see a couple of years of quarterly updates, budget phones rarely fare as well. Given, by definition, there's little money to be made from budget phones, these devices rarely see more than one initial security update.

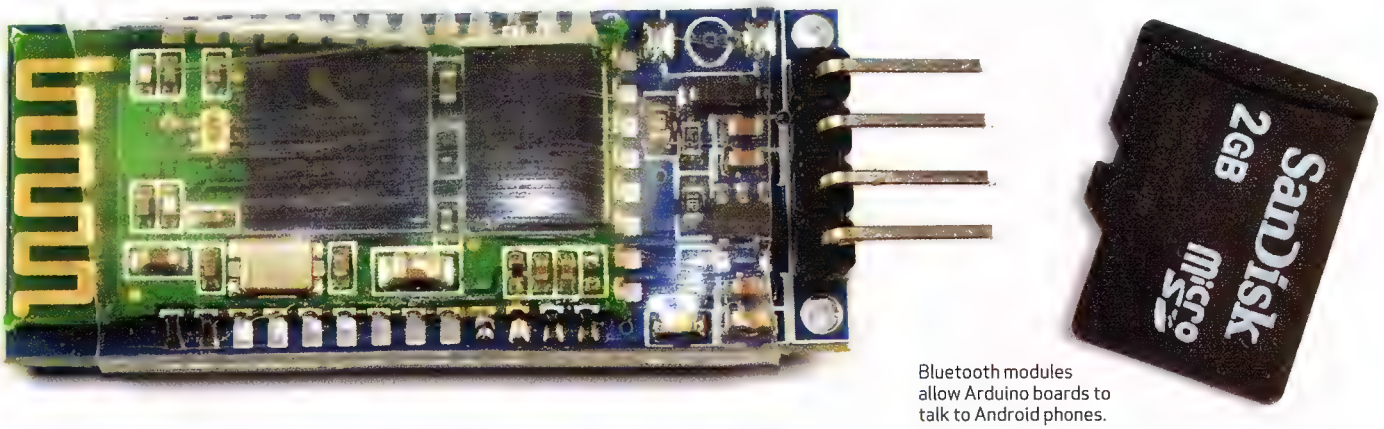
The MediaTek rootkit vulnerability is said to be serious enough that the chip maker couldn't afford to leave its solution update in the hands of phone makers. As a result, reports are it tapped Google to push out a special security update directly to affected devices. That's drastic – but so is the flaw, which is said to allow an app to gain temporary elevated privileges or 'root access' and do lots of fun things with your phone.

AFFECTED MEDIATEK CHIPS

The list of MediaTek chips affected is substantial and said to include the following units:

MT6735, MT6737, MT6738, MT6739, MT6750, MT6753, MT6755, MT6757, MT6758, MT6761, MT6762, MT6763, MT6765, MT6771, MT6779, MT6795,

"To be fair, though, living with budget phones isn't necessarily a life of beer and skittles."



Bluetooth modules allow Arduino boards to talk to Android phones.

"With Telstra planning to shut down the 3G network in June 2024, despite still being four years away, you can expect to see cheap 3G phones flood the market."

MT6797, MT6799, MT8163, MT8167, MT8173, MT8176, MT8183, MT6580 and MT6595.

It covers a range of phone models from Motorola, Oppo, Sony, Huawei and others.

To know if you have one of these chips, head to Google Play and download 'CPU-Z' and either look at the initial 'SoC' tab or the secondary 'Device' tab. In my case, the ZTE Blade B112 has one of the affected chips, the MT6735, so it's a live issue for me.

However, before you use this to write-off budget phones altogether, Samsung and LG phones featuring certain Qualcomm chips were noted late last year as suffering a 'secure world' security flaw that could enable root-access and other security leaks.

The Mediatek issue goes by the security code 'CVE-2020-0069' and the fix is built into the March 2020 Android security patch.

GO EDITION OS

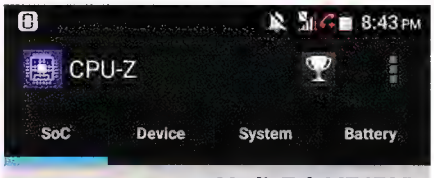
Budget-priced phones are also the domain of 'Go Edition' versions of Android, my recent purchase of a ZTE Blade A3-2019 lurking as the 'Telstra Essential Smart 2' being my first. Go Edition releases are for devices with 1GB of RAM or less and a result of ever-increasing OS complexity filling up RAM and making low-spec devices seem sluggish to use.

While Go Edition gives you lighter-weight Google apps, the OS itself hasn't affected any of productivity apps I've tried so far, nor does it appear to overly restrict performance.

The Blade A3-2019 features a 1.4GHz quad-core Cortex A53-powered Unisoc SC9832E chip and from some preliminary machine-learning bench-tests I've carried out, it appears to have roughly 90% of the performance of Motorola's 2017 $399 Moto G5 phone and its eight-core Qualcomm Snapdragon 430 chip. For a phone that cost me $44.50, that's not a bad result. The screen is definitely not as good and it lacks USB-OTG, but I'll argue for some applications, it gives more bang for buck than a Raspberry Pi 4.

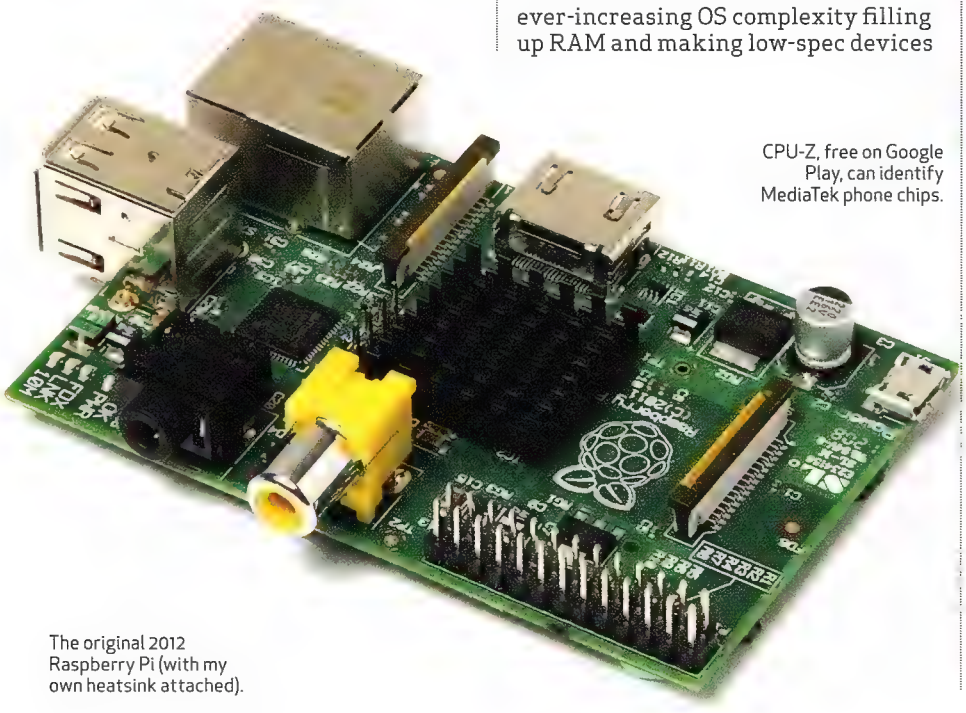
CONNECTIVITY

Connectivity generally isn't an issue either for budget phones – Bluetooth 4, Wi-Fi b/g/n and 3G/4G phone network access are all pretty standard



CPU-Z, free on Google Play, can identify MediaTek phone chips.

MEDIATEK	MediaTek MT6735 988 MHz
Cores	4
Architecture	4x ARM Cortex-A53 @ 988 MHz
Revision	r0p4
Process	28 nm
Clock Speed	221 MHz - 988 MHz
CPU 0	988 MHz
CPU 1	988 MHz
CPU 2	988 MHz
CPU 3	988 MHz
CPU Load	79 %
GPU Vendor	ARM
GPU Renderer	Mali-T720



The original 2012 Raspberry Pi (with my own heatsink attached).

I bought one of these, but couldn't get an HDMI output out of it.

on every phone now. With Telstra planning to shut down the 3G network in June 2024, despite still being four years away, you can expect to see cheap 3G phones flood the market. Again, though, depending on your application, this might not be a problem.

However, in our book, a budget phone becomes a throw-away device if it doesn't support USB-OTG. We've covered USB On-The-Go a bit recently, and although not perfect, it provides connectivity to a range of external devices, making it a must-have in our book. If you have no use for USB-OTG, then it's not a problem, but as we've seen, USB-OTG goes a long way to taking Android phones from 'consumer' to 'creator' status.

Of the phones we mentioned earlier, only the now-previous-gen Telstra-locked Nokia 2.2 at $89 has OTG on-board. However, given its other features – 2GB of RAM, 5.7-inch HD screen and decent 2GHz quad-core speed – it seems a decent buy at that price. Somewhat unfortunately, however, its chip is a Mediatek MT6761, so it'll also need the March 2020 security patch as soon as possible.

ANDROID TV SET-TOP BOXES

Phones aren't the only low-cost options for getting hold of Android SBCs. At the same time we reported on the R-Pi launch in September 2012, we noted the arrival of dedicated Android TV set-top boxes (STBs) in the form of USB sticks. Back then, they matched the single-core status of the R-Pi CPU, but with more recent tech, giving better performance – and at lower prices. Those lower prices continue today with compact SBCs flooding Ebay and specialty electronics online retailers. Essentially, take an Android tablet, remove the screen and battery, add in two or three USB ports, whack the whole thing in a box about the size of a 3.5-inch hard drive and that's pretty much it.

I've bought a number of these over the years as the CPUs have steadily improved, but with mixed results. The most recent model was an MX-Q Pro 4K, boasting at the time a quad-core CPU, 2GB of RAM, 16GB of on-board flash, three USB 2.0 ports, HDMI output, optical S/PDIF output, WiFi and Ethernet. A nice little unit I was looking forward to mucking around with.

Unfortunately, it was dead-on-arrival. Had I purchased it from a local retailer, I would've had some recourse, but in purchasing it direct from overseas, I was up for at least return-postage, which would've been as much as I paid for it in the first place, so I just wrote it off. That said, it was a rare failure.

However, the thing to be really careful about with these low-cost Android TV boxes is security. According to a 2019 Sophos report (**tinyurl.com/y3d4vq5v**), many of these devices feature preloaded software that can side-step your router's firewall and do nasty things like steal your WiFi network name and password or credit card details.

At the very least, we'd suggest you don't use your main Google account on one of these devices – create a secondary account with as little personal info as possible to protect yourself. As much as I love the potential these boxes have, I'm no longer willing to take the risk – particularly with local prepaid budget phones offering great tinkering value.

LEARN TO CODE

The 2018 Programme for International Student Assessment (PISA) results released at the end of 2019 showed the maths and science skills of Australian high-school students continue to decline, a trend going back to 2006 and at a time when these skills are needed more than ever (**oecd.org/pisa/publications/PISA2018_CN_AUS.pdf**). Programming falls within these two skill areas and while some might question whether Australia actually has a shortage of skilled coders, the reality is the next generation will rely on software even more than we do now.

Python is generally the go-to learners' language and that's not a bad thing, but the key is understanding and knowing the science of programming, not just a single language syntax. Look up any high-level programming role on an employment website and few mention just one language. For example, data scientists are often required to have Python, R and SQL. Java and C# still slot into many 'top five' programming languages.

What does this have to do with budget phones? Well, they actually make a great learning platform – learn Java or Kotlin to create your own Android apps, learn how accelerometers work or how to programmatically link devices using Bluetooth. I see them as a kind of 'digital LEGO' – learn the skills and use your imagination.

It's long been known that coding not only develops problem-solving skills, it can improve maths skills as well, so while phones might be banned in some schools, they can be still be a great learning tool at home – if you set the boundaries right.

PHONES? OR COMPUTERS?

As good as the Raspberry Pi is, there's a decent case to be made for prepaid budget phones in Australia. The R-Pi 4 has kicked away in terms of overall performance, but budget phones are a complete, portable computing package and with a number of them now well below the Australian retail price of an R-Pi 4, they're an alternative worth considering. ■

Choosing the right OS for your mobile tablet

Christian Cawley shows you how to customise your Raspberry Pi tablet project and choose the right touch-friendly operating system.

Raspberry Pi projects are never quite as straightforward as they appear. Many (if not all) of the tutorials featured in *APC* are crystallised moments – the result of days, weeks or even months of research that bring us to a point of usability. The project might work and work well, but there is always room for improvement.

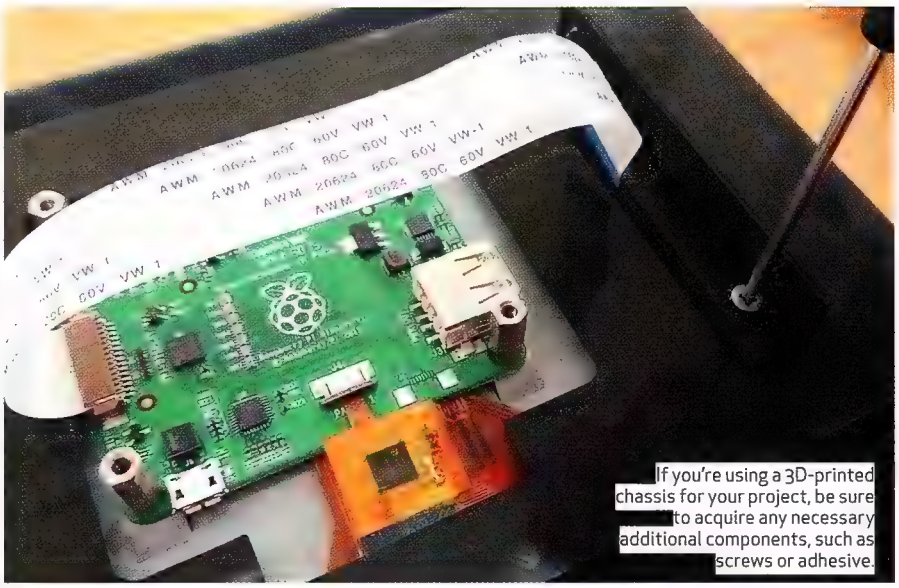
CHOOSING A CHASSIS

Raspberry Pi tablet-builders have two options for a case: take advantage of an existing product, or else fabricate a customisable option (this will typically be a 3D-printed case).

Cases designed to fit a Raspberry Pi and the official touchscreen display are a good starting point. The OneNineDesign Case for Raspberry Pi Official 7-inch Touchscreen from The Pi Hut (**http://bit.ly/LXF261-case**) is an acceptable starting point, but it's short of space for portable power. The SmartiPi Touch Case (**http://bit.ly/LXF261-smartipi**) has similar shortcomings, although the superior build quality and mounting options make it a must-have regardless. With some redundant behind-screen space, it's just possible that this could make a suitable tablet case for your Raspberry Pi.

There is no reason to stick with a Raspberry Pi for your DIY tablet project. STL files are available from Thingiverse for NovelDesignLab's Tablet Frame for Raspberry Pi, Arduino, and other SBCs (**http://bit.ly/LXF261-frame**). Mounting the Pi (or your chosen board) on a removable panel that doubles as a tablet stand is a smart piece of design.

Assembling a 3D-printed case for your Raspberry Pi might require additional components. These are typically listed with the STL files. For example, the case might be designed with screws for securing the components. Take the time to order the exact size of screw from the suggested resource. When assembling the case for your tablet, take extra care not just with the electronic components within but with screws and screwdrivers, and the 3D-printed plastic. It might be wise to tape wires clear of screw holes to avoid inadvertent power issues and shorts.



If you're using a 3D-printed chassis for your project, be sure to acquire any necessary additional components, such as screws or adhesive.

Other materials can be used to build your own Raspberry Pi tablet. You could rely on Lego, although this is likely to be unnecessarily bulky. Whatever you use, take your time to plan everything. Ensure you have the right Raspberry Pi and touch display for the chassis you're planning to use. If you're starting from nothing and don't own a 3D printer, consider using cardboard for early development.

Of course, 3D printing a case for a Raspberry Pi 3 when you're using a Raspberry Pi 4 is going to result in some tweaking. Take care to ensure that the ports are correctly lined up with access slots.

POWER TO THE PI

Rechargeable batteries for the Raspberry Pi have improved considerably since its release in 2012. Back then, the solution was almost always a portable smartphone charger. Big, bulky and difficult to keep permanently attached the computer, such chargers are rarely used these days.

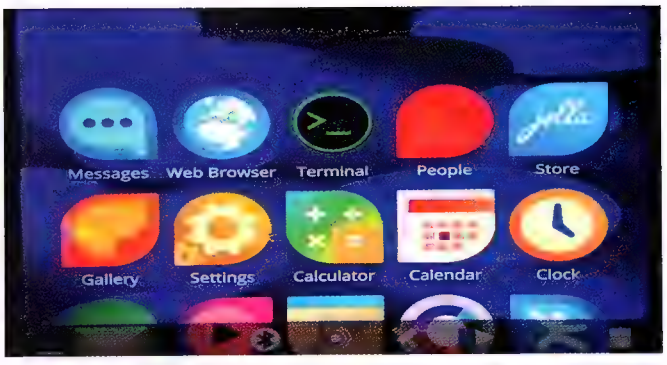
The right power solution for a tablet project needs to be compact and capable of delivering power to both the Raspberry Pi and the touch display. LiPo batteries are almost certainly the best option (although you could go completely DIY and power your Raspberry Pi tablet with AA or AAA batteries) with the 4000mAh battery from The Pi Hut (**http://bit.ly/LXF261-lipo**) capable of powering a Raspberry Pi for several hours. This contrasts with the original project that uses a 1000mAh cell. While space might be at a premium with your chosen Raspberry Pi chassis, it's worth exploring all options for maximum uptime.

Note, however, that the size of the display will impact on battery life. So

Quick tip

Our original tablet project relies on the official Pi 7-inch touchscreen display. Instead of being limited by this, consider alternative displays. You might prefer a 4-inch HyperPixel display, a 5-inch screen, or even the 10.1-inch Industrial Touchscreen display. Choose one that suits your needs and adapt the 3D printed chassis to suit.

Raspberry Pi Touch Operating Systems

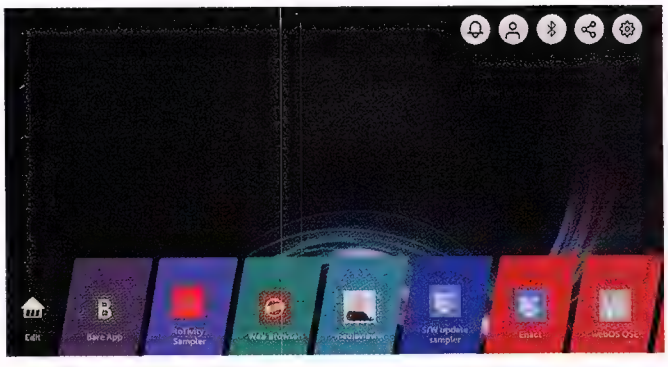


1 UBUNTU TOUCH

On paper, Ubuntu Touch should be the touch OS of choice for Raspberry Pi users. It's been in development for years, continued beyond Canonical's abandonment thanks to the UBports team, and recently added Raspberry Pi support. However, builds are unreliable at this stage. While Ubuntu Touch might be the best option for Raspberry Pi tablet projects in future, try at your own risk (**http://bit.ly/LXF261-ubports**).

2 SAILPI (SAILFISH OS)

While Sailfish OS has been abandoned, a version was released for the Raspberry Pi 2. Dubbed SailPi, it combines the Sailfish OS with support for the Pi's GPIO. Sadly, the project hasn't been updated within the past five years, but if you're looking for a basic OS with a web browser, this is good enough. You can grab SailPi from the Internet Archive (**http://bit.ly/LXF261-sailospi**).



3 LUNEOS

Most people have forgotten webOS, HP's mobile OS that was abandoned after its phones and tablets line went south. These days it's usually seen as the OS on LG smart TVs. Its mobile version is known as LuneOS, which retains the look and feel of webOS. Relatively stable, it's a strong alternative to Plasma Mobile. Nightly and stable releases can be found at webos-ports.org (**http://bit.ly/LXF261-webos**).

4 PLASMA MOBILE

A solution to your Raspberry Pi touchscreen project that works very well, Plasma Mobile runs on Raspbian Lite. Importantly, this lets you retain that important integration between the Raspberry Pi and its default operating system. Plasma Mobile is the best non-Android touch OS for the Raspberry Pi. See the boxout overleaf for a look at how to set up Plasma Mobile on the Raspberry Pi.

the larger the display, the larger the battery capacity you'll need for any sort of prolonged use, unless you keep the tablet near a plug or attach a portable smartphone charger… which of course defeats the object.

In addition, a PowerBoost device from Adafruit is recommended. This should be chosen specifically for use with the corresponding battery; it's a device for managing power and enabling the battery to be recharged via a USB port, so it's important to get this right. Additionally, a power switch can be mounted and connected to the PowerBoost, immediately elevating the Raspberry Pi to the level of an actual tablet, rather than just an SBC with no power button that is posing as a tablet.

The customisable nature of a DIY Raspberry Pi 3D-printed tablet makes upgrading your chosen power solution far simpler. You can upgrade it as and when it's required!

RIP OFF RASPBIAN

If you've spent any time with Raspbian then you'll know that as good as the PIXEL desktop is, it's almost useless as a tablet user interface UI). If anything, it harks back to the original Windows tablets in the early 2000s, in which a finger or stylus was required to drag the mouse pointer around.

Most operating systems are designed for mouse and keyboard. While it is quite possible that you're happy to retain Raspbian as your tablet's operating system, several choices are available that will make your tablet a lot easier to use.

A Raspberry Pi tablet requires a touch UI that is simple and straightforward to use, one that makes the best use of the display real estate as possible. There's no point having an icon that most fingers can't hit properly, for example.

So, aside from a few menus and desktop icons, Raspbian (and other standard Raspberry Pi operating systems) is utterly useless as a tablet. The solution, therefore, is to create something from scratch, or embrace a

Quick tip

Plasma Mobile should run without trouble, but it is primarily a UI for phones. Detailed instructions on installing and troubleshooting Plasma Mobile can be found on hacker Tinker's webpage (**www.tinker.sh/kde-plamo-rpi**)

"While a web interface can easily prioritise mobile websites, for example, it's much tougher to rework the user interface of existing Linux apps to be suddenly touch friendly."

tablet operating system. The problem with a custom solution – perhaps a web UI like Webian (**http://bit.ly/LXF261-webiantouch**) – is that you're limited to those apps that can be configured to be 'touch friendly'.

While a web interface can easily prioritise mobile websites, for example, it's much tougher to rework the user interface of existing Linux apps to be suddenly touch friendly.

Our tablet tutorial featured the Android-based LineageOS, which works well with a Raspberry Pi 3B. However, some alternatives are available, which we explore further in the boxouts. But what if you really want to use Raspbian?

INJECT THE PLASMA

Fortunately, the solution here is straightforward. If you're already running Raspbian, or just want to avoid the other operating systems, Plasma Mobile is a great way to add a tablet-style user interface. Designed for touchscreens (specifically phones), 2019 saw Plasma Mobile's development team introduce support for the Raspberry Pi.

Specifically, you'll need Raspbian Lite installed, flashed to your SD card using Etcher (**http://bit.ly/LXF261-etcher**), or via NOOBS setup. You have two options to enable SSH:

1. Open the /boot/ directory on your PC, create a blank text file called ssh (no file extension).
2. Alternatively, you can boot the Pi with a keyboard attached and open raspi-config, then open Interfaces to enable SSH.

Whichever you choose, your Raspberry Pi will then be remotely accessible within your local network via your SSH client.

Next, update the firmware and reboot:

```
sudo rpi-update
sudo reboot
```

Once backed up and running, open config.txt in nano:

```
sudo nano /boot/config.txt
```

Scroll through and uncomment the line near the end:

```
#dtoverlay=vc4-fkms-v3d
```

Hit Ctrl-X to save and exit, then reboot again. After, confirm dirmngr is installed:

```
sudo apt update && sudo apt install -y dirmngr
```

It's necessary to edit the sources list to add repos.

```
sudo nano /etc/apt/sources.list
```

Then ensure that the following repos are listed, adding if necessary:

```
deb http://raspbian.raspberrypi.org/raspbian/ buster main contrib non-free rpi
deb http://ftp.debian.org/debian/ buster main contrib non-free
deb https://repo.kaidan.im/debpm buster main
```

Once again, save and exit nano, then add new keys for the repos:

```
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys 8B48AD6246925553 CF31927555bE40EC
```

Follow this with a full Raspbian upgrade:

```
sudo apt update && sudo apt -y full-upgrade && sudo apt autoclean && sudo apt -y autoremove
```

We are almost done here, with just a little bit of sysadmining required. Create a new user, phablet and add it to sudoers:

```
sudo adduser phablet
sudo usermod -aG sudo phablet
```

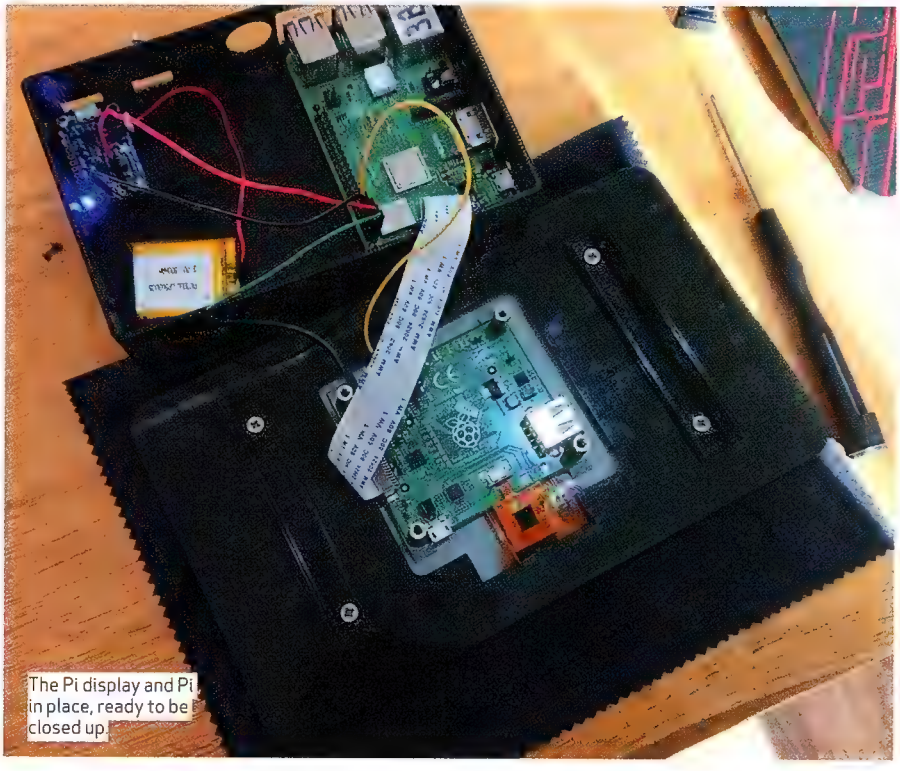
Change to user phablet and input the password when you're prompted:

```
su - phablet
Remove user pi:
sudo deluser pi
```

Finally, you can install the following components for Plasma Mobile:

```
sudo apt -y install plasma-phone-components plasma-phone-settings plasma-settings kwin-wayland simplelogin dbus-x11
```

Follow this with a reboot; just a few moments later, the Raspberry Pi tablet should boast a shiny Plasma Mobile user interface.

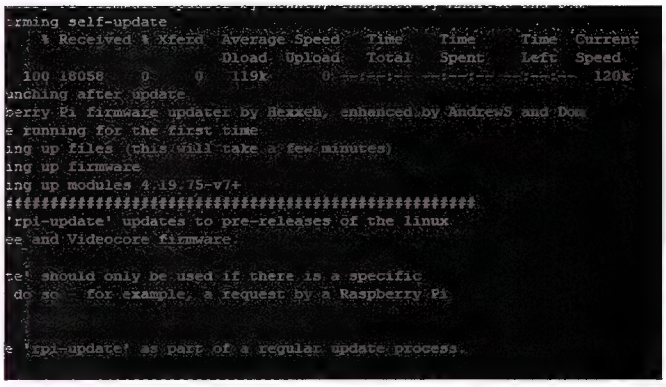


The Pi display and Pi in place, ready to be closed up.

Quick tip

While 3D printing hardware has become increasingly affordable, plenty of people don't yet own one. The affordable alternative to buying a 3D printer is to use a mail-order printing service. If you're using designs from Thingiverse, there's the option to 'Order This Printed' and have the build delivered to your door.

Set up Plasma Mobile on a Raspberry Pi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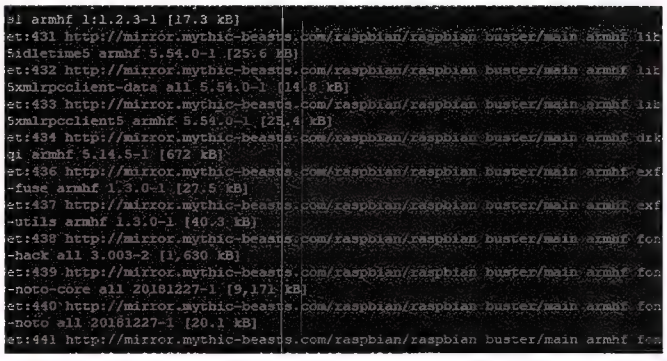
ee and Videocore firmware
te' should only be used if there is a specific
do so - for example, a request by a Raspberry Pi
e 'rpi-update' as part of a regular update process.

1 DECIDE ON PLASMA MOBILE

If the idea of installing a new operating system on your Raspberry Pi for a tablet project doesn't appeal, consider Plasma Mobile. Developed as a means to introduce KDE Linux to smartphones, Plasma Mobile is basically a desktop environment that is compatible with Raspbian. So while the Raspberry Pi tablet runs Raspbian Lite, it has Plasma Mobile set as the UI.

2 INSTALL RASPBIAN LITE AND ENABLE SSH

Start off with a fresh install of Raspbian Lite (**http://bit.ly/LXF261-rasplite**), written to an SD card with Etcher. Once done, with the microSD still in your computer, browse the /boot/ directory and create a new file called ssh without a file extension. This file acts as a flag to enable SSH and enable remote connections. Use this to set up Raspbian Lite with Plasma Mobile.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:431 http://mirror.mythic-beasts.com/raspbian/raspbian buster/main armhf lib
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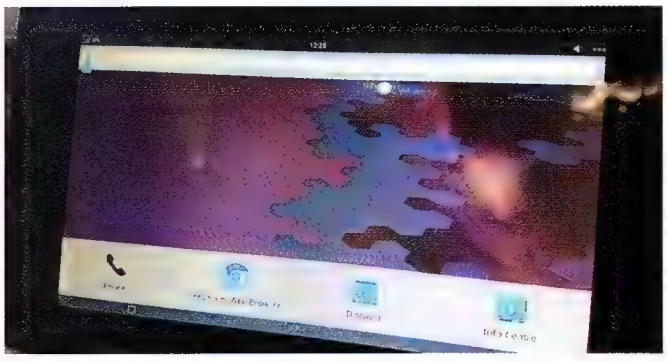
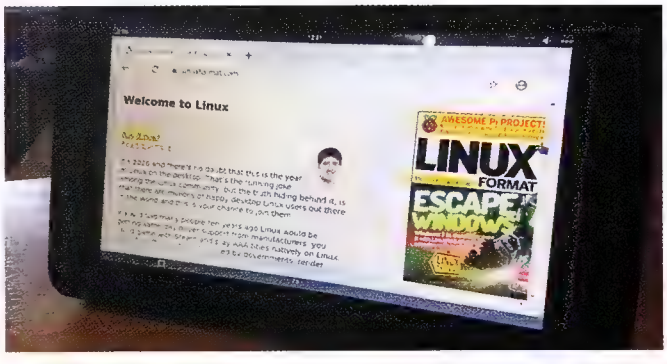


3 CONFIGURE RASPBIAN AND INSTALL PLASMA MOBILE

The steps (see previous page) for installing Plasma Mobile are required to configure Raspbian Lite, switch repo sources, run a full update, and create a new user. Once this is done, a new user can be created and Plasma Mobile installed. This will launch automatically each time Raspbian boots. Your Raspberry Pi tablet is ready to use – so what can you do with it?

4 GET TO GRIPS WITH THE UI

Plasma Mobile has a simple, intuitive user interface. When it loads up, you will see the lock screen. As you might with an iOS or Android device, swipe up to reveal the password field. You will later see all the default apps listed, with the opportunity to swipe up again to access the settings. Things are a little functional in places – use KSysGuard to check processes, for example.



5 ACCESS NOTIFICATIONS AND SHORTCUTS

Following the Android design language, Plasma Mobile features settings shortcuts at the top of the screen, accessed by dragging them down from the edge. This includes things like Wi-Fi, sound, and location settings. You'll spot things that might seem odd, such as mobile data. Display brightness can also be set, and there is a Shutdown button. Meanwhile, recent notifications can be reviewed and dismissed here.

6 INSTALL APPS, BROWSE THE WEB

Minimal apps are installed with Plasma Mobile. To change this, you'll need to install apps manually, so why not start with a browser? Use SSH to get started, and install the Chromium browser remotely with: `sudo apt install chromium-browser` Check the Plasma Mobile repos for more apps or use your Raspberry Pi tablet as a handy internet slate. ■

How AI joins the fight against coronavirus

We've seen nothing like it for a century, but can the battle against coronavirus be fought and won by Artificial Intelligence? Darren Yates explains.

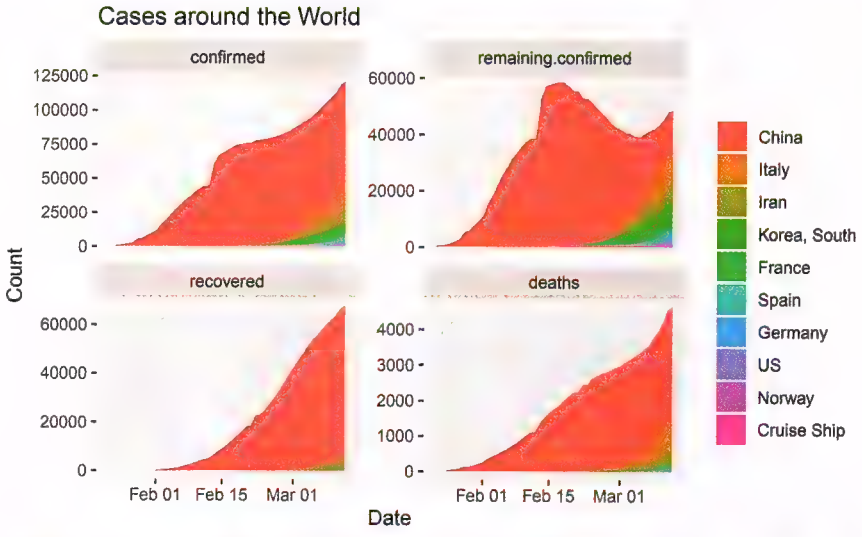
The first six months of 2020 haven't exactly been the rosiest way to ring in a new decade. If it hasn't been bushfires blackening huge chunks of the eastern Australian seaboard, its coronavirus sweeping across the globe. Not to mention our crazy new relationship with toilet paper. But as the pandemic spreads, artificial intelligence and its components of machine-learning and data-mining are playing vital roles in the fight. We look at some key players and how you can learn to analyse infection rate data yourself.

ANALYSING THE EARLY DATA

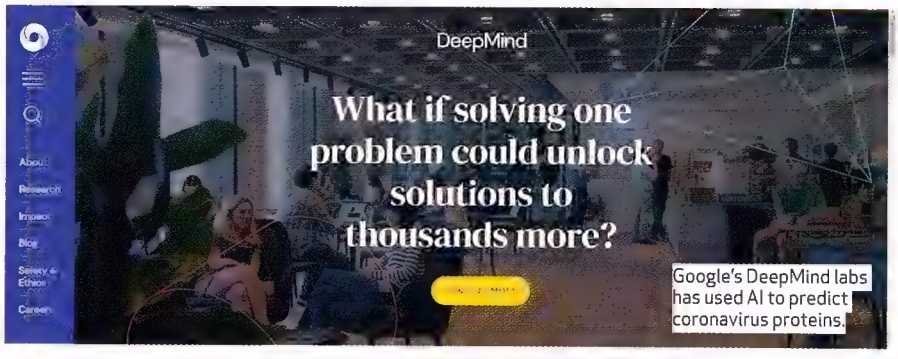
One of the earliest published reports on the new 2019 novel coronavirus (originally dubbed '2019-nCoV' and now 'COVID-19') was written by Chinese medical scientists and published in late-January 2020 in *The Lancet* medical journal. You can read it online at **www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2930183-5** (PDF, free). The report covers just the initial 41 patients detected with the illness up until January 2, 2020. Yet even with this small sample, the report authors were able to identify characteristics of the illness using various data analysis methods from high-tech DNA bioanalysis through to simpler statistical techniques. For instance, the authors found that those patients over 65 years of age were more likely to require intensive care. They also identified symptoms and their level of commonality amongst patients including fever, cough and shortness of breath.

BIG TECH APPLIES ITS MUSCLE

However, the authors acknowledged there were still considerable gaps in their knowledge of this new disease and that further work was needed. DeepMind is an AI company purchased by Google in 2014 and in mid-March, it announced it had taken the last 60 years of DNA and protein research and combined it with 'deep learning' to arrive at a best estimate on protein structures making up the COVID-19 virus. By understanding the proteins that power a virus, researchers are said to be better placed to find a cure.



Coronavirus infection rate data is easier to grasp using data visualisation.



Google's DeepMind labs has used AI to predict coronavirus proteins.

Machine-learning is used here to speed up that process.

The DeepMind news came in the same week as word spread that the U.S. government was enlisting Silicon Valley to bring its AI skills to bear against the virus. Reports are these skills would be deployed on soon-to-be-released research about the virus by the government, but also against misinformation spreading online before it goes viral.

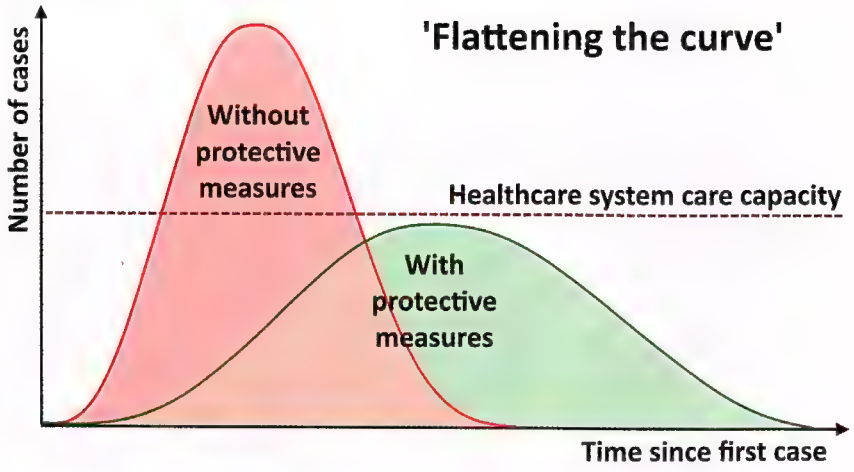
BASIC ANALYSIS YOU CAN DO

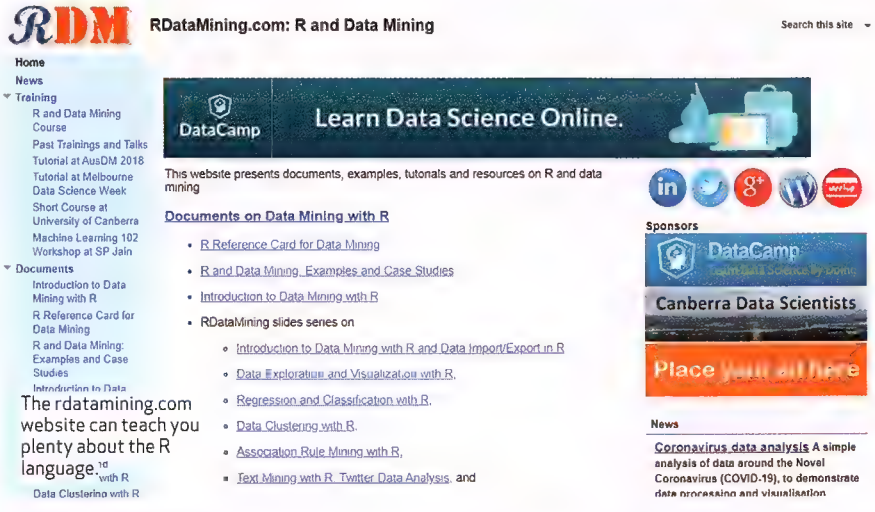
While most of us typically don't have access to the sort of cloud computing horsepower Google has to play with, you can perform simple coronavirus data analysis on your PC. Global coronavirus infection rate data is publicly available and tutorials online explain how to use data processing and visualisation to better understand the data.

Now this is not to trivialise in any way the seriousness of the outbreak, but rather to highlight the importance of data in real-life situations like this. Machine-learning, data mining and 'AI' are all hyped-up, must-have skills, but the point of machine-learning and having all of this data is to gain knowledge and understanding from it. One of the key skills now being sought by employers is the ability to communicate that knowledge in ways that stakeholders – customers, your boss or even heads of government – can understand and use to make informed decisions.

Among these key communication skills is data visualisation, which is

The 'flatten the curve' chart has gone viral over the last few months.

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Data Exploration and Visualization with R,
Regression and Classification with R,
Data Clustering with R,
Association Rule Mining with R,
Text Mining with R: Twitter Data Analysis, and
Sponsors
DataCamp
Canberra Data Scientists
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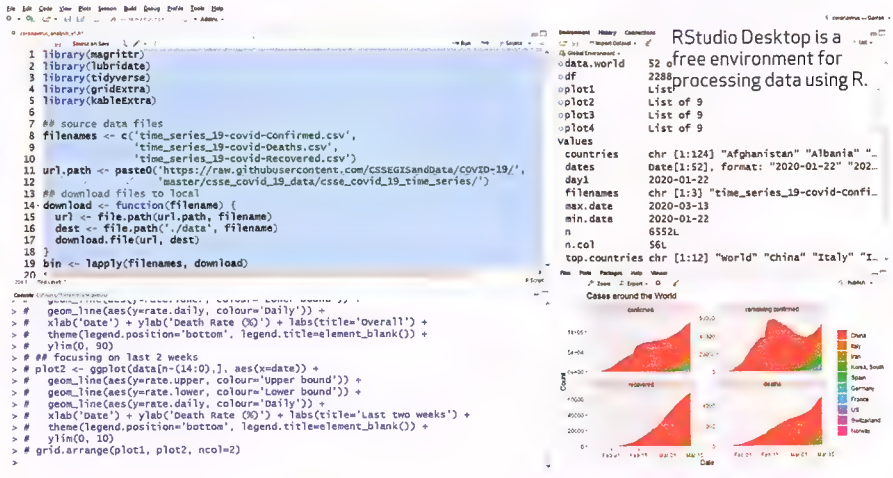
News
Coronavirus data analysis A simple analysis of data around the Novel Coronavirus (COVID-19), to demonstrate data processing and visualisation
The rdatamining.com website can teach you plenty about the R language.


RStudio Desktop is a free environment for processing data using R.

really how to present knowledge from data in a simple and ideally compelling visual representation. During the last few months, one data representation has gone viral as it encourages populations to 'flatten the curve' and reduce peak-demand on hospital and healthcare systems.

As data visualisations go, it's about as simple as it gets – but 'simple' is king to getting your key data message across. In this case, it's a message that could actually save lives.

One of the coronavirus data tutorials has been developed by Australian research scientist, Dr. Yanchang Zhao, who runs an excellent website on all things 'R', the statistical programming language (**rdatamining.com**). The tutorial provides a 'step-by-step' on how to use R to process the coronavirus data. This data is sourced from the Centre for Systems Science and Engineering at John Hopkins University in the U.S. and contains updated records of worldwide infection numbers. You can download the guide at **rdatamining.com/docs/Coronavirus-data-analysis-world.pdf** (PDF).

WHERE TO GET R

The R programming language is one of the world's most popular machine-learning tools. It's free, open-source and works on any PC or laptop. Download the version of R for your OS from the Australian CSIRO mirror at **https://cran.csiro.au**. Install it, then grab hold of R-Studio Desktop (**rstudio.com/products/rstudio/download**), which is a basically an integrated development environment (IDE) for R. RStudio allows you to create and execute R projects, as well as install popular R library packages that expand the language, similar to Python, if you're more familiar with it.

Just make sure you install the R language first, followed by RStudio Desktop, as the latter looks for the former during installation.

FOLLOWING THE TUTORIAL

To get going on the tutorial, you must first fire up RStudio and from the menu, select 'File, New Project'. Next, choose 'New Directory', then 'New Project' and give your project folder a name and its root location (I chose 'coronavirus' and 'c:\users\darren' for these options). Next, locate that project folder using your file manager and create a 'data' subfolder. For example, I have a 'c:\users\darren\coronavirus\data' file path.

Next, head back to RStudio and from the menu, select 'File, New File, R Script'. This brings up the script editor panel. At this point, you enter the commands from the PDF (hint: you can copy and paste). To execute, click on the 'Source' icon at the top-right of the script editor panel. To fix 'library not found' errors, click inside the lower-left 'console' panel and launch the command:

```
INSTALL.PACKAGES('xxxx')
```

where 'xxxx' is the missing library package. Each time you install a new package, you re-run the script. The charts/plots will appear in the 'Plots' tab of the low-right folder panel in RStudio. If you get stuck, you'll find plenty of help on the rdatamining.com website. (Hint: execute each section of the PDF code before moving on by selecting all code with CTRL-A and execute with CTRL-Enter).

MORE TO LEARN

The work being done in AI, machine-learning and data-mining is not only at the forefront of fighting COVID-19, but many other diseases as well. However, it doesn't really matter which industry you're in – there can be valuable knowledge in data. Gaining the skills to find it is up to you. ■

downtime

PC GAMER EDITOR SHAUN PRESCOTT BRINGS THE GAMING NEWS.

After success of its digital shopfront, Epic Games will move into publishing

The company behind *Fortnite* has big plans.

Epic Games, the behemoth company behind *Fortnite*, Unreal Engine 4 and the Epic Games Store, is moving into multiplatform publishing – and it's already secured some deals with top developers. Three studios, including Remedy (*Alan Wake*, *Control*) Playdead (*Limbo*, *Inside*) and Gen Design (*Ico*, *Shadow of the Colossus*) have signed up to be published with Epic Games Publishing, which offers some virtually unprecedented transparency when it comes to its publishing deal terms.

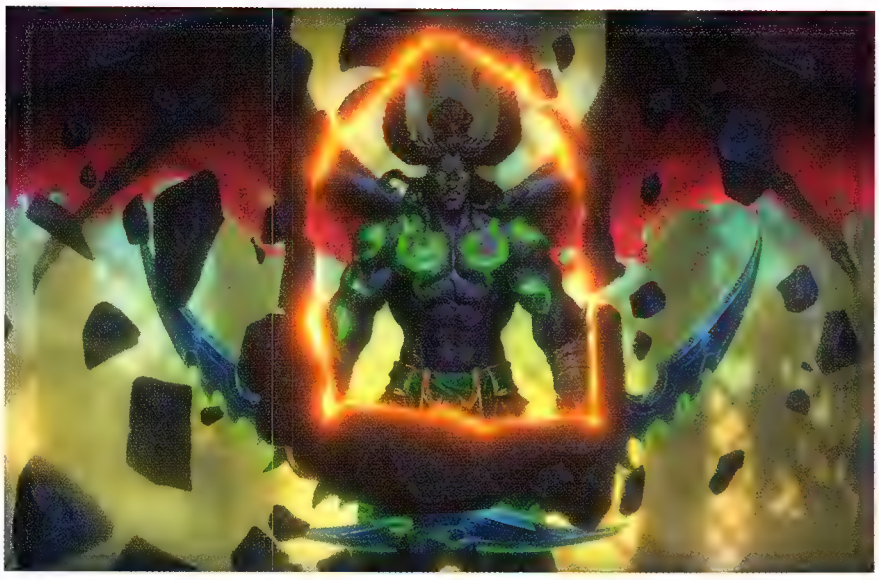
For example, Epic claims it will cover all associated development costs, running the gamut from wages through to marketing. Once Epic has recouped its costs following release, studios will receive fifty percent or more thereafter. Most importantly for games enthusiasts, this deal grants total creative control to the developer, as well as ongoing rights to the intellectual property. In a statement, Epic Games CEO Tim Sweeney said that the company is "building the publishing model we always wanted for ourselves when we worked with publishers."

Gearbox Software co-founder Landon Montgomery has died

MONTGOMERY WORKED ON THE *HALF-LIFE*, *HALO*, AND *BORDERLANDS* SERIES DURING HIS CAREER.

Landon Montgomery, co-founder of Gearbox Software, has died. The news was confirmed last month by Gearbox Software. "We are heartbroken after learning today of the passing of one of our co-founders, Landon Montgomery," the statement reads. "In our earliest years, Landon played a big role in helping to set our path. We will always be thankful and remember him for being a part of our lives. During this trying time, our thoughts, support, and affection are with those who were closest to him."

Montgomery worked at Bethesda Softworks as an artist and level designer on *The Elder Scrolls Adventures: Redguard* and *An Elder Scrolls Adventure: Battlespire*, before co-founding Gearbox Software in 1999. Following that, he worked on some of the best known game series of the previous decade, including *Half-Life*, *Brothers in Arms*, *Halo: Combat Evolved*, and *Tony Hawk Pro Skater 3*, before leaving the studio in 2010. Montgomery remained involved with games, however, working as esports program director at marketing firm The Richards Group and then as general manager at MMO studio Daybreak Game Company. In late 2019 he took up a producer position at Nvidia.



Hearthstone Demon Hunter class coming this April will be free to all players

Hearthstone's long-awaited 10th class is nearly here.

The Hearthstone Demon Hunter, a full-fat 10th playable class, will launch on April 7 alongside the Year of the Phoenix, Blizzard announced today. This is the first new class in the six-year history of *Hearthstone*.

Players will get to know the Hearthstone Demon Hunter, played by Illidan Stormrage, starting on April 2 through a four-part single-player campaign. This will introduce Demon Hunter's class abilities while explaining the history of Illidan, AKA the brother of Druid hero Malfurion Stormrage. The campaign will conclude when the class officially launches on April 7.

This introductory campaign, and the Demon Hunter class itself, will be free to all players. Not only that, players will receive all 10 Basic Demon Hunter cards, plus 20 cards from the broader card pool. Demon Hunter will gain 15 cards per expansion throughout the Year of the Phoenix – 45 total, which is 15 more than the other classes – so while its card pool will be relatively small at first, it will grow rapidly. That said, its power level in Wild remains to be seen.

No Man's Sky dev to release new game *The Last Campfire* this summer

NEW INDIE ADVENTURE COMING DOWN THE TRAIL.

The Last Campfire, Hello Games' first project since releasing *No Man's Sky*, is launching this summer for Nintendo Switch, PS4, Xbox One, and PC.

A new trailer was revealed during the latest Nintendo Indie World Direct, which revealed the platform information and release date.

First announced at The Game Awards in 2018, the adventure follows Ember, who is on a journey to light the titular last campfire. Expect some puzzles and tears as Ember embarks on the quest.

This smaller scale project is clearly a departure from Hello Games' sci-fi explorer, but we're really digging its somber but cute aesthetic. Lead character Ember almost reminds us of a Chibi version of *Journey*'s main character, while the game's light puzzling looks like it'll be pretty soothing. A line on the game's official website gives us a hint at where the story will be going, as it explains, "Travel deeper into the lands beyond the dark forest and overcome the adversities before you."

Valve is rebooting its failed card game

GABE NEWELL COMMENTS ON THE CCG'S TRAJECTORY.

Valve is currently revamping its failed collectible card game *Artifact*, which released in 2018 to strong reviews but conspicuous ambivalence from gamers. In one of his first comments on the game's trajectory, Gabe Newell was sanguine."We ran an experiment, we got a negative result, and now we need to see if we've learned anything from that, so let's try again. And that's what [the *Artifact* team] have been doing and that's what they're getting ready to release."

A PS4 exclusive has been confirmed for PC

***HORIZON ZERO DAWN* WILL RELEASE ON STEAM THIS WINTER.**

While Microsoft has opened the floodgates on its Xbox exclusives also releasing for PC, Sony and Nintendo have been far less forthcoming. But Sony has made the first big move into cross-platform releases, with news that its 2017 open world adventure *Horizon Zero Dawn* will release on Steam some time this winter. No other first-party Sony games have been confirmed or even talked about, but rumours are afoot that *God of War* could be the next cab off the rank.

Gears 5 will be optimised for Xbox Series X

THE COALITION SHOWED OFF A DEMO FOR THE GAME DURING AN XBOX ANNOUNCEMENT

The Coalition's Mike Rayner showed off the opening cutscene of *Gears 5* running on the Xbox Series X with Ultra settings - the same used for the PC version of the game. The version Rayner showed off has a 50% higher particle count than the PC specs and higher texture resolutions. It also runs at 60 fps in 4K, which is double the frame rate of the Xbox One X, and The Coalition team is looking into a version that would run 120fps for multiplayer games.

Control DLC *The Foundation* gets June release date on Xbox One

***CONTROL*'S FIRST BIG DLC PACK RELEASES ON XBOX ONE THREE MONTHS AFTER THE PS4 AND PC LAUNCH.**

Control's first big paid expansion, *The Foundation*, is coming to PS4 and PC on March 26, and on Xbox One on June 25.

We've known the new Control DLC would release on March 26 as a PS4 timed-exclusive, but it's news that it's coming to PC, via the Epic Games Store, on the same day.

We also know now that Xbox One players will need to wait a whole three months longer for *The Foundation* than PS4 and PC players. ■

$99 | PC, PS4, XB1, STADIA, SWITCH | BETHESDA.NET

Doom Eternal

One of the most intense shooters ever made.

I just finished *Doom Eternal* and I'm feeling anxious and exhausted. I've kneed the underside of my desk too many times to count from tensing up. My hands are soft from sweating and my knuckles crack when I try to make a fist. A computer game actually managed to hurt me. *Doom Eternal* is a celebration of excess. Excess in sin, in violence, scale, speed, and volume. I've never played a shooter this intense and demanding.

Doom Eternal also runs beautifully on a wide range of hardware and feels designed for a mouse and keyboard first. It's a modern classic, with a few caveats. Cheap deaths from getting stuck on geometry happen too often. There are six or seven layers of unnecessary progression. *Doom*'s dark humour has mostly been traded in for deep lore and a high-fantasy cosmology.

The moment-to-moment combat is distilled panic rather than empowerment. I live for the fleeting moments my head gets above water within the hurricane of light and noise and violence, and I pull off a feat of accuracy and reflex I never thought I was capable of. *Doom Eternal* is a tough teacher. A few hours in I'm getting by just fine, juggling half a dozen weapons, belching fire on the hordes to spawn armour, tossing grenades at every opportunity to stun and soften up the crowd. I'm dashing in and out of the action for the occasional Glory Kill to keep my health topped up, dodging projectiles and managing the arena, deciding, between breaths (if I remember to breathe) which demons to attack based on who's currently kicking my arse the most.

There is a lot of new stuff to digest: a lot of progression systems. Weapon points, runes, secrets, sentinel batteries, suit upgrades, challenges, weapon mods, skins, weapon mod upgrades, weapon mastery upgrades – it's a lot. Too much, really, because *Eternal* places the bulk of these upgrades along the critical path. By the end I had almost every upgrade and without trying too hard to find them all, as if it's all an elaborate front built to make players feel good while ensuring they stay at pace with the steep difficulty curve.

The ability to climb certain walls, dash in midair, and swing from monkey bars makes for some challenging navigation sequences, but I wanted to spend more time soaking in *Eternal*'s incredible settings rather than dashing my way through them.

Doom Eternal is one of the most demanding arena shooters I've ever played, a game that hones every muscle memory committed to my right forearm and left hand fingertips since they graced a mouse and keyboard. It's bright and loud, hyper violent yet tastefully refined, and absolutely draining. I can't recall playing a shooter where sensory overload was one of the most common reasons for death.

James Davenport

Verdict

A ceaseless, panicked nightmare that pushes you with more skill and style than ever before.

★★★★½

$28 | PC, LINUX | CROWBARCOLLECTIVE.COM

Black Mesa

An incredible fan remake of Half-Life.

The *Half-Life* series is really just one long bad day at work, and *Black Mesa* is a Valve-approved, albeit entirely fan-made, chance to relive Gordon Freeman's disastrous morning – but with prettier visuals, combat and physics lifted from *Half-Life 2*, bigger levels, and other upgrades.

Black Mesa sticks closely to Half-Life in terms of structure. You take the tram into work, watch in horror as the resonance cascade floods the facility with aliens, dodge headcrabs in the office complex, clash with the HECU Marines, deal with giant tentacles in the blast pit, fight through a warzone on the surface, navigate the radioactive Lambda Core, and finally visit Xen. But everything is bigger, more detailed, and more dramatic, with production values in line with *Half-Life 2* (if not quite as high), which breathes new life into the Black Mesa Incident. Some levels have been remixed too, with redesigned, or in some cases completely new, puzzles and set-pieces. So even if you know *Half-Life* inside out, there'll still be some surprises here.

However, purists may question some of developer Crowbar Collective's design and aesthetic choices – and some things are so detached from the source material that it occasionally feels like an entirely new game. *Black Mesa* is not a 1:1 remake, so it'll never feel as authentic as revisiting the original. But it's a fresh, modern, and lovingly made take on a landmark moment in PC gaming.

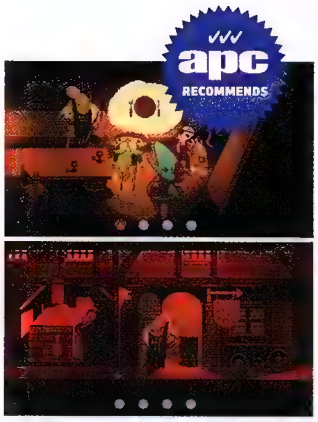
Some locations have even been transformed entirely. In the Interloper chapter, Freeman encounters enslaved Vortigaunts in a factory-like cloning facility; however, in *Black Mesa* this section has been replaced by a bigger, much more evocative new location that really highlights the true misery of the Vorts' enslavement.

This is a professionally made game, and arguably the best way to experience *Half-Life* on a modern gaming PC. For some the original will always be the best, but this is a superb re-imagining that uses the underlying systems of *Half-Life 2* to great effect. ■ Andy Kelly

Verdict

A quality remake that broadens the scope of the original and massively improves its final chapters.

★★★★½



The Supper

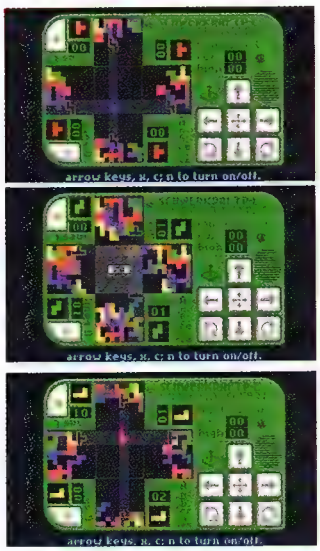
Serving up grisly deserts.

FREE | PC | PIXELSHUH.ITCH.IO/THE-SUPPER

This is a game about rooting out ingredients, and bunging them in a big, bubbling cooking pot, before serving them up to your guests and... seeing what happens. It's a twisty interactive fantasy story, made by an emerging master of the form, Octavi Navarro. You might know the developer for the *Midnight Scenes* anthology series. Well, this is darker, more confidently written and drawn than those sci-fi point-and-clicks.The dockside fantasy setting reminds me a little of *the Monkey Island* series, but the comedy here is far more grotesque in nature, as you make three dishes for your three important guests. With little dialogue, *The Supper* tells a violent story, in the vein of *Sweeney Todd*, but it confidently becomes its own thing by the end of the game.

It's the narrative that comes first, and it's hard to argue with that when you've seen the story through to its conclusion. You've probably played better big adventure games, but there's an art to making the small ones. You must only dish out so much, leaving fluff like side dishes back in the kitchen. *The Supper* is all protein, dripping in special sauce. ■ Tom Sykes

★★★★½



Schwerkraft-projektions-geraet

Four-play Tetris.

FREE | BROWSER | BIT.LY/2ITWKFW

The problem with *Tetris* is that it's too easy. One falling block at a time, and a single pile to take care of. No, what the game needs is four piles of *Tetris* blocks. Basically, what *Tetris* needs is to be four games at once. This game has achieved this by taking away the time pressure: you're given all the time in the world to align each tetromino. The rub is that, as it falls automatically to the bottom of the screen, it will also fall to the left, to the right, and to the top of three other playing fields, with the block splitting into four right after you select its trajectory.

You can position and rotate the block before it falls, it will fall in the same way to each of the four playing fields. That configuration of the L-piece might tidy up a line on one game board, but it may bring another closer to devastation. If any board piles too high it will, of course, be game over – so there are four outcomes to consider, every single turn. ■

Tom Sykes

★★★½☆

apc HOT PRODUCT

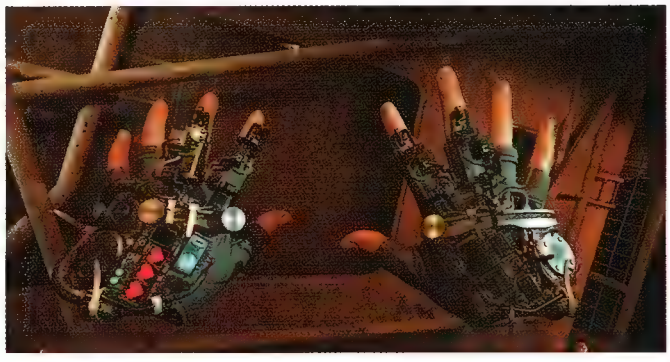
$84 | PC | HALF-LIFE.COM/EN/ALYX

Half-Life: Alyx

The big AAA game that VR so badly needed.

I didn't have much doubt *Half-Life: Alyx* would be a great VR experience – Valve makes its own VR headset and software, after all. But I was sceptical it could also be a great, proper *Half-Life* game, and I was thrilled to discover it really is. While it's sandwiched between the events of *Half-Life* and *Half-Life 2* the repercussions of its story extend well into whatever future there is for the *Half-Life* series, and its technical accomplishments will leave most other developers, once again, struggling to keep up.

Five years before the events of *Half-Life 2*, Alyx Vance is performing surveillance and recon in the Combine-controlled City 17. It's immediately engaging to be back in City 17 again, so familiar yet so much more impressive in VR, an environment I don't need to just look at and admire but one I can actually run my virtual fingertips across and crane my neck back to take in fully. When a city scanner takes my picture I instinctively hold my hands up against its blinding camera flash. Combine Metro Cops seem larger than life because they're now actually life-size. I've seen Striders before but I've never had one step over me in VR as I stared up at it, utterly dumbfounded, watching it sink its massive feet into the side of a building, using the crumbling masonry as a step to walk itself up to a rooftop. During the opening minutes, and at plenty of times during the entire game, I just had to stop, stand still, and simply take it all in.



Half-Life: Alyx took me roughly 13 hours to complete, and while the slow and measured pace and claustrophobic setting of the first half felt occasionally stifling, the second half flew by as the intrigue of the story took its hold and the combat got far more exciting, varied, and excellently fast-paced.

The ending is, frankly, wonderful, surprising, exciting, not to mention more than a bit puzzling when you really stop to think about it. ■

Chris Livingston

Verdict

Valve has created both a technically impressive VR experience and another memorable *Half-Life* game.

★★★★½

$20 | PC | BIT.LY/3AKWVRU

Corruption 2029

Smartly designed but lacks flavour.

Corruption 2029 is set in a dystopian semi-post-apocalyptic America, split into a forever war between two indistinguishable factions: the enemy NAC (New American Council) and the player-aligned UPA (United Peoples of America). These wars are fought between 'units', soldiers that have been so heavily cybernetically augmented that they have seemingly lost all free will and are controlled remotely by drone-piloting commanders.

There's a real lack of personality here, especially compared to *Mutant Year Zero*, whose cast of loveable anthropomorphic weirdos were far more memorable. Even by the standards of *XCOM*, Corruption is wanting, with no visual customisations, no permanent levelling choices, and no permanent death, the units are as interchangeable and unmemorable as the fiction states they are. The environments are equally underwhelming, with the same handful of locations re-used for multiple missions, and you'll find yourself repeatedly raiding the same motel over and over. It gives the impression this entire continent-spanning war is actually being fought in a single one-horse town.

All of which is a shame, because once you dig into the tactical toolbox on offer, you'll find a lot of fun toys to play with. Each level has two distinct phases – units can wander around in real-time so long as they aren't seen, then drop into turn-based combat to fight.

Much of this first phase becomes an intricate dance where you carefully figure out just how to inflict the perfect amount of damage so that the enemy gets taken out before anyone notices. Weaker enemies can be killed by the handful of silenced weapons on offer, but tougher ones require tricks – maybe you can lure them out of range of their allies, where louder weapons can be used, or perhaps you can hit them with a stun attack to get a precious second turn of silent shooting.

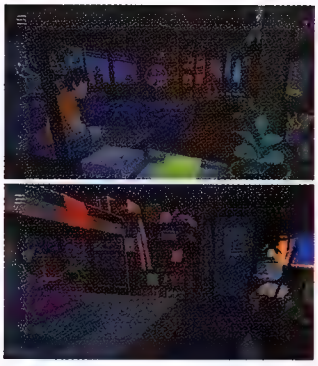
Fans of *Mutant Year Zero* might want to check it out for another dose of turn-based stealth tactics, but anyone else should opt for its more illustrious predecessor. ■

Tom Hatfield

Verdict

Lots of fun turn-based tactical shenanigans, but in a rather drab and simplistic wrapper.

★★★☆☆



Respite

Take a load off.

FREE | PC, MAC | KLAIIS.ITCH.IO/RESPITE

Respite – surely the world's most chilled out adventure game – explores the hazy morning after the stressed-out night before.After (eventually) getting up, here you'll explore your swish shared apartment, traipsing to the living room, the kitchen, even into your flatmates' rooms while they're away. Not that the game sees this as a violation of personal space, as you've volunteered yourself to water the plants in their absence. Really, you're there to find little notes from a well-meaning flatmate, who gently insists that you've been working too hard, and should probably take a rare day off today. The backstory unfolds as you read these cute little missives, and as you examine fixtures inside your cluttered home.

This is a sweet, refreshingly mellow and well-meaning game. But it does feel slightly limited, as it probably won't speak to the people who have to work – who can't afford to take a day off, even for their health. This is less *Gone Home*, and more Stayed Home, rewarding your curiosity with a messy apartment full of objects to examine, and snippets of backstory to glean. ■

Tom Sykes

★★★☆☆

Edgeworth, being smug as always.

Phoenix Wright: Ace Attorney Trilogy

Revisiting Capcom's flamboyant courtroom drama. By Rachel Watts

This collected trilogy has had quite the journey to PC. The three included games were originally released in 2001, 2002 and 2004 as Japan-exclusive GBA titles. After success over there, they made their English debut in North America and Europe, launching on the Nintendo DS. From there the trilogy was once again ported to the Nintendo Wii and iOS in 2013 and then again onto the 3DS in 2014. The three games finally made their debut onto PC last year, bundled as the *Phoenix Wright: Ace Attorney Trilogy*. The PC port lets new players experience the visual novel series for the first time, and allows fans to revisit the thrills of being back in the courtroom.

Bouncing from console to console, you would think the trilogy would have been through major changes. But, apart from a graphics revamp and a few small mechanical tweaks, the *Ace Attorney* trilogy has been left relatively untouched. Playing it now on PC is almost the same as when it was first released over two decades ago. Capcom's courtroom adventure has humour, suspense, thrills, twists, and turns that remarkably still hold up today from when I played it back in 2005. And I will swear to that under oath.

The trilogy includes the first three games in the series: *Phoenix Wright: Ace Attorney*, *Phoenix Wright: Ace Attorney – Justice for All*, and *Phoenix Wright: Ace Attorney – Trials and Tribulations*. It's not just an anthology of interesting murder investigations, but also features wonderfully flamboyant characters, witty wordplay, suspenseful twists, and no end of over-the-top drama.

Though since playing all those years ago, I've become a bit more literate in what a lawyer actually does, and when playing through the games again there are definitely parts that deserve a raised brow and a side-eye. The series throws courtroom etiquette out the window, and usually the law book right along with it. But hey, it's all worth it for the sake of the capital D Drama. Objection overruled.

It's not afraid to get completely ridiculous at times, but always

couples it with moments of satisfying revelation and a truly epic flair for melodrama. Backstabbing? You got it. Tragedy? Naturally. Lawyers slamming hands on desks, aggressively pointing and shouting at each other? Of course. Each game is more outrageous than the last, with the ultimate case in the final game being a crescendo of events that would leave Judge Judy speechless.

CRIME AND PUN-ISHMENT

The trilogy follows the story of Phoenix Wright, a rookie attorney wanting to make a name for himself as a skilled defence lawyer. You play as this enthusiastic upstart as he tries to prove his client's innocence against false accusations (which 99.9 per cent of the time is a murder charge). There are a handful of cases in each game, and they have two stages: evidence gathering, and then the trial.

In the first stage, you need to gather important pieces of evidence, which means searching the crime scene for clues and interviewing witnesses for testimony to help your investigation. Back in the DS days, this meant tapping my stylus over every millimetre of the small screen making sure I didn't miss anything. An improvement for the PC version is a magnifying glass icon that has a tick when I hover over a place I've already searched – it makes my search rather less frustrating.

The bulk of the investigation is speaking to witnesses and characters connected to the case at hand. There's a lot of text to read through, but the writing is as sharp and hilarious as Phoenix's spiky hairdo. Revisiting the cases allows me to experience again some of the trilogy's colourful characters, like the grumpy grandma, Wendy Oldbag, a security guard who is vital in a case, but every third word of her testimony is calling you a whippersnapper. Or Mike Meekins, an officer who is better at being a wet noodle than a member of the police force.

THE LAWS OF FASHION

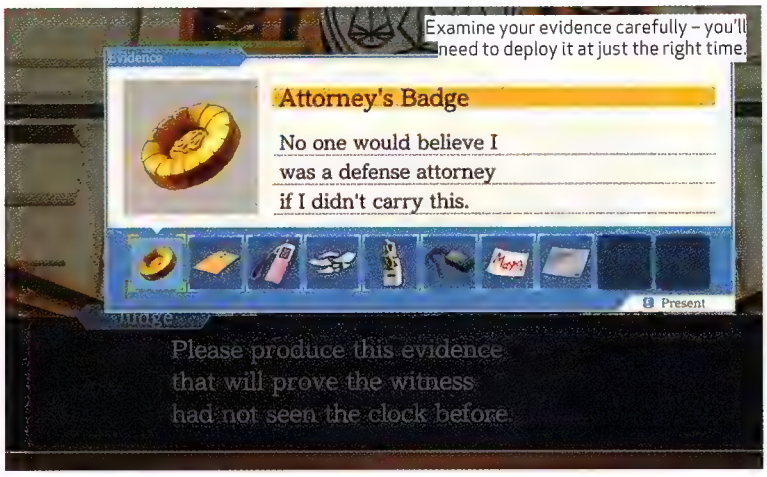
How to look the part of an Ace Attorney

1 HAIR GEL
Every attorney needs an outrageous hairstyle. It's an intimidation tactic.

2 ATTORNEY BADGE
Proof of all that time and money spent slaving away in law school.

3 DRESS TO IMPRESS
Even if you completely flop, you can still do it in style with some natty threads.

4 OVERCONFIDENT EXTERIOR
Hide the fact that you're completely out of your depth.


Examine your evidence carefully – you'll need to deploy it at just the right time.
Evidence
Attorney's Badge
No one would believe I was a defense attorney if I didn't carry this.
Present
Judge
Please produce this evidence that will prove the witness had not seen the clock before.

The crime in this case took place on the set of a samurai show.

The investigation phase gives you an idea about what went down, but the full truth of what happened is all revealed in the trial itself. Gathering evidence sets the groundwork for information that comes to light in the courtroom, but throughout my replay, I just couldn't wait until the courtroom scenes. In the two later games, *Justice for All* and *Trials and Tribulations*, the series tries to liven these parts up but they never match the rush of excitement found in the courtroom. You might have a roundabout idea about how the crime was carried out, but it isn't an Ace Attorney trial if the case isn't turned on its head halfway through – and knowing there's a twist coming makes me impatient to get there.

MAKIN' THE LAW

When you're done gathering everything you need for trial, the second stage of the story begins. It's time to present your case in court. The trial is structured around interviewing witnesses and cross-examining their testimony with your evidence. You also have to rebut the prosecution's accusations as the trial develops. But that's where the overlap between how courtrooms work in reality and how they work in *Ace Attorney* ends.

Capcom doesn't just see the courtroom as a place of stuffy back-and-forth rebuttals, but a cross between a high stakes battle arena and Spanish telenovela. Surprise witnesses, evidence submitted mid-trial, and testimonies that keep changing every few minutes probably wouldn't fly in a real criminal case. But in Ace Attorney they provide escalating drama as your understanding of the proceedings keeps shifting.

Opposite Phoenix as he battles for his client's innocence are the prosecuting attorneys, and each is more ruthless than the next. In the first game, this mantle is taken up by the dashing but cold-hearted Miles Edgeworth. He's an undefeated lawyer who's determined to get a guilty verdict in every case. He's brutal, but he does rock a cravat.

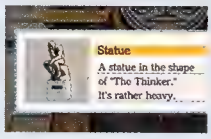
Joining you on the defence bench is your assistant, Maya Fey, a spirit medium (yep) who is the next leader in line of a powerful clan of mystics. When you are totally stuck she gives you little hints on what you should focus on to move the case forward, and has helped me out of a tough spot a number of times.

There's also the bumbling but lovable detective Dick Gumshoe who works for the prosecution, and sitting above everyone in the

TRIAL AND ERROR Top tips for cross-examining tricky witnesses

Check the autopsy report. It updates automatically as more details get revealed.

Press every part of a testimony. Witnesses can reveal more info that you can use.



Read the description of every piece of evidence – you might have missed something.

Ask Maya for help. She always gives small hints if you're in a bit of a pickle.

Wendy Oldbag may be elderly but she's got plenty of sass.

courtroom is the bushy-bearded judge, who is unfortunately very easily swayed. The graphics-revamp makes the game's previously rough pixelated edges look more sleek and polished which I greatly enjoy, mainly because Von Karma, a monster of a prosecutor, doesn't terrify me as much as he does with all his scary jagged parts smoothed out.

The same core cast of characters appear throughout multiple cases, to the point where it plays out like a soap opera, their lives entangled with the investigations. Expect juicy family drama, childhood flashbacks, and cruel betrayals.

As you make your way through the climactic witness cross-examinations, you need to listen to their testimony and present evidence that proves a contradiction, catching them out on the stand. All the clues you have collected during the first stage comes into play at some point during the trial. This is where the main puzzle element of the game comes in. Knowing your evidence, the details of the case, and when to present them to the court is how you get to the truth of the mystery. There you go, those are my top tips as a seasoned defence attorney.

ACES HIGH

The *Ace Attorney* series does have some pitfalls when it comes to presenting evidence. Some moments where you have to prove a contradiction can be pretty obscure, and if you get it wrong your courtroom health bar, prominently displayed in the top right corner of the screen, depletes with a small but dramatic explosion.

Even having already playing through these cases and knowing who committed the crime, and understanding roughly how the trial would play out, there were moments where I still couldn't figure out which evidence I needed to present at a particular moment.

Luckily, the PC version has multiple save slots, meaning you can save and load to your heart's content. You can also dip in and out of the different games in any order you want, so if you're stuck you can hop into another one for a break.

Issues like these are few and far between, though, and most of the time the game's puzzles are solvable with some outside-the-box thinking. But, of course, Edgeworth isn't going to just let you command the courtroom as you please, and one of the best feelings in the Ace Attorney series, that continues through its multiple spin-offs and sequels, is going head-to-head with the opposing prosecutor.

As the trial develops, events begin to escalate and when you're at the core of the case is where the games really shine. As one of the attorneys hits a crucial bit of information, the music will start to swell. Suddenly, you're being catapulted back and forth across the courtroom as Phoenix and Edgeworth rebut each other's points. There's desk slamming, finger pointing, "Objection!" flying left and right. It's impossible not to get swept up in it.

There aren't many games that are filled with thrills and humour like the Ace Attorney trilogy, and my replay only proves for me that its sharp humour hasn't dulled at all over the years. The melodrama and mysteries are tied together with a flair that still makes it a standout in the detective and visual novel genres. ■

New rules	Reason
Abnormal body shape, chubby, have obvious beer belly, obese, or too thin (not limited to: dwarf, acromegaly)	Unlike diversified videos of which the content itself is the mainly focus, in the non-diversified content, the character himself/herself is basically the only focus of the video, therefore, if the character's appearance or the shooting environment is not good, the video will be much less attractive, not worthing to be recommended to new users.
Ugly facial looks (not limited to: disformatted face, fangs, lack of front teeth, senior people with too many wrinkles, obvious facial scars) or facial deformities (not limited to: eye disorders, crooked mouth disease and other disabilities)	
The shooting environment is shabby and dilapidated, such as, not limited to: slums, rural fields (rural beautiful natural scenery could be exempted), dilapidated housing, construction sites, etc. (For internal housing background which has no obvious slummy character, only those cases as specified should be labelled: crack on the wall, old and disreputable decorations, extremely dirty and messy)	This kind of environment is not that suitable for new users for being less fancy and appealing.
Slide show video with any kinds of picture	Not the ideal video form of our plataform.

TikTok pressures mods to filter out ugly people

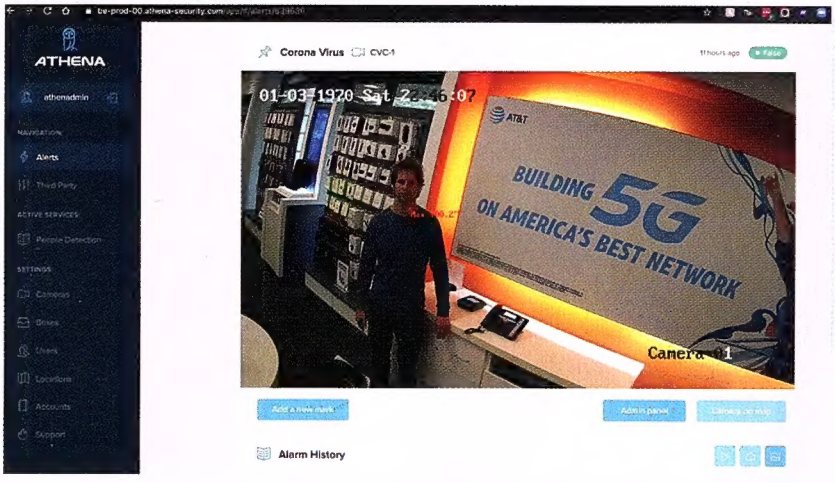
Video companies told moderators to only promote videos by the wealthy, no 'chubbys'.

In a series of internal documents leaked to *The Intercept*, it has been revealed that Chinese micro-video social media company TikTok has been systematically encouraging the suppression of content containing unattractive, impoverished, or disabled users. The internal document instructed moderators to exclude any videos in the promoted 'For You' section that included people who are or have an: "Abnormal body shape, chubby, obvious beer belly, obese, or too thin (not limited to: dwarf, acromegaly)[sic]". It also required the exclusion of those with 'ugly facial looks', "senior people with too many wrinkles", anything shot in 'shabby' environments and those with "eye disorders, crooked mouth disease and other disabilities".

New IR surveillance camera claims to ID coronavirus subjects

PUBLICALLY AVAILABLE THERMAL IMAGING CAMERAS MAY BREACH CIVIL LIBERTIES WITH FALSE POSITIVES.

If ClearView AI wasn't enough of a challenge for the USA's rapidly evolving landscape on national surveillance it seems Texan-based Athea Security is promoting a new infrared camera that can detect people running a fever (as some COVID-19 positive patients do). While there are some environments where these cameras will be useful in the emerging pandemic, the company is pitching its tech to be used everywhere from airports to local supermarkets. The company advocates that a positive ID of temperature requires an additional temperature test, smaller shops may rely solely on these IR cameras to eject shoppers that are not sick.

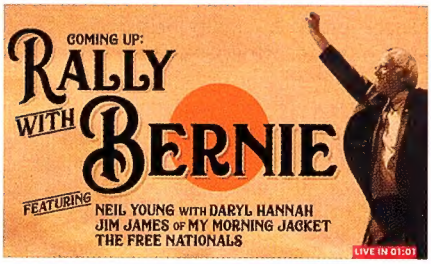


Alameda County Sheriff
@ACSOSheriffs
Tesla: @Tesla is not an essential business as defined in the Alameda County Health Order. Tesla can maintain minimum basic operations per the Alameda County Health Order.
10:49 AM · Mar 18, 2020 · Twitter for iPhone
273 Retweets 862 Likes

US Govt. says Tesla is 'not an essential business'

MUSK FORCED TO SHUT DOWN FACTORIES DESPITE THINKING THAT THE 'CORONAVIRUS PANIC IS DUMB'.

After Tweets in March claiming that "The coronavirus panic is dumb", Musk attempted to reassure Tesla factory workers by saying they were more likely to die from driving than from the COVID-19 – a comment that starkly contrasted with the World Health Organisation and US Centers for Disease Control. Ignoring official mandates established on the 17th of March, Tesla kept its factory running through Silicon Valley's first day of a stay-at-home order in the Bay Area under the justification that it was an 'essential business'. However, the following day the Alameda County Sheriff Tweeted that "@Tesla is not an essential business…" and that it was only permitted to "maintain minimum basic operations".

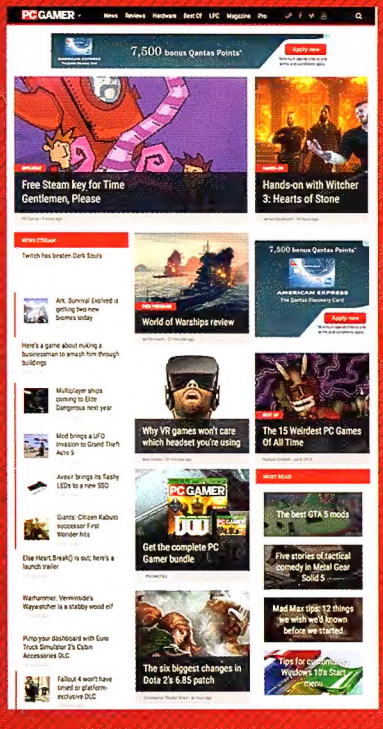


Bernie Sanders hosts first virtual campaign rally

RALLY BROADCAST GOES VIRAL DESPITE CORONAVIRUS LOCKDOWN.

Featuring a solo guitar and harmonica performance by Neil Young and a series of other dial-in guest appearances, Bernie Sanders held one of the first fully online broadcast-only rallies in US history. The pre-recorded event was cast simultaneously to a number of official Facebook, Periscope, and Twitch accounts to reach a broad online audience. While frontrunner in the Democratic Primaries Joe Biden also conducted more intimate Zoom meetings with key voters in order to minimise the risk of spreading the coronavirus, Sanders' youthful voter base is much more tech savvy and willing to engage in novel online gatherings like a full scale virtual rally. ■

SMARTER COOKIES ENABLED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Why VR games won't care which headset you're using
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Avext brings its flashy LEDs to a new SSD
Giants: Citizen Kabuto successor First Wander hits
Else Heart.Break() is out; here's a launch trailer
Warhammer: Vermintide's Waywatcher is a stabby wood elf
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